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No. 2484.—VOL. LIII.

LONDON, SATURDAY, MARCH 31, 1883.

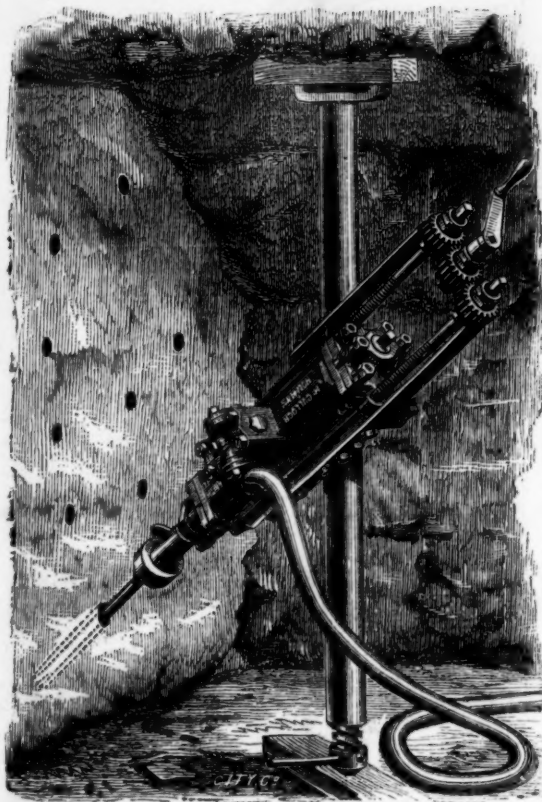
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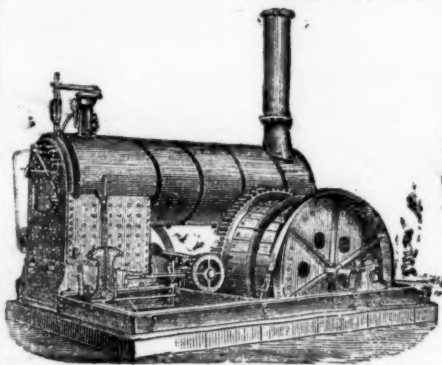
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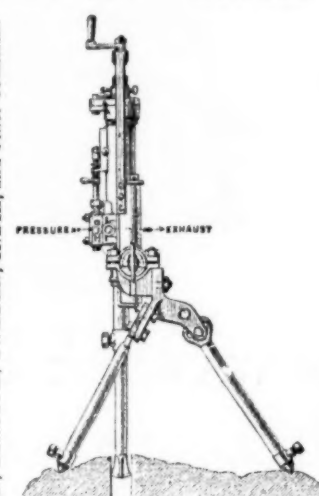
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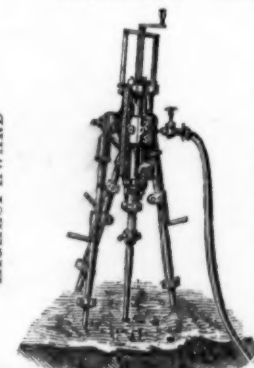
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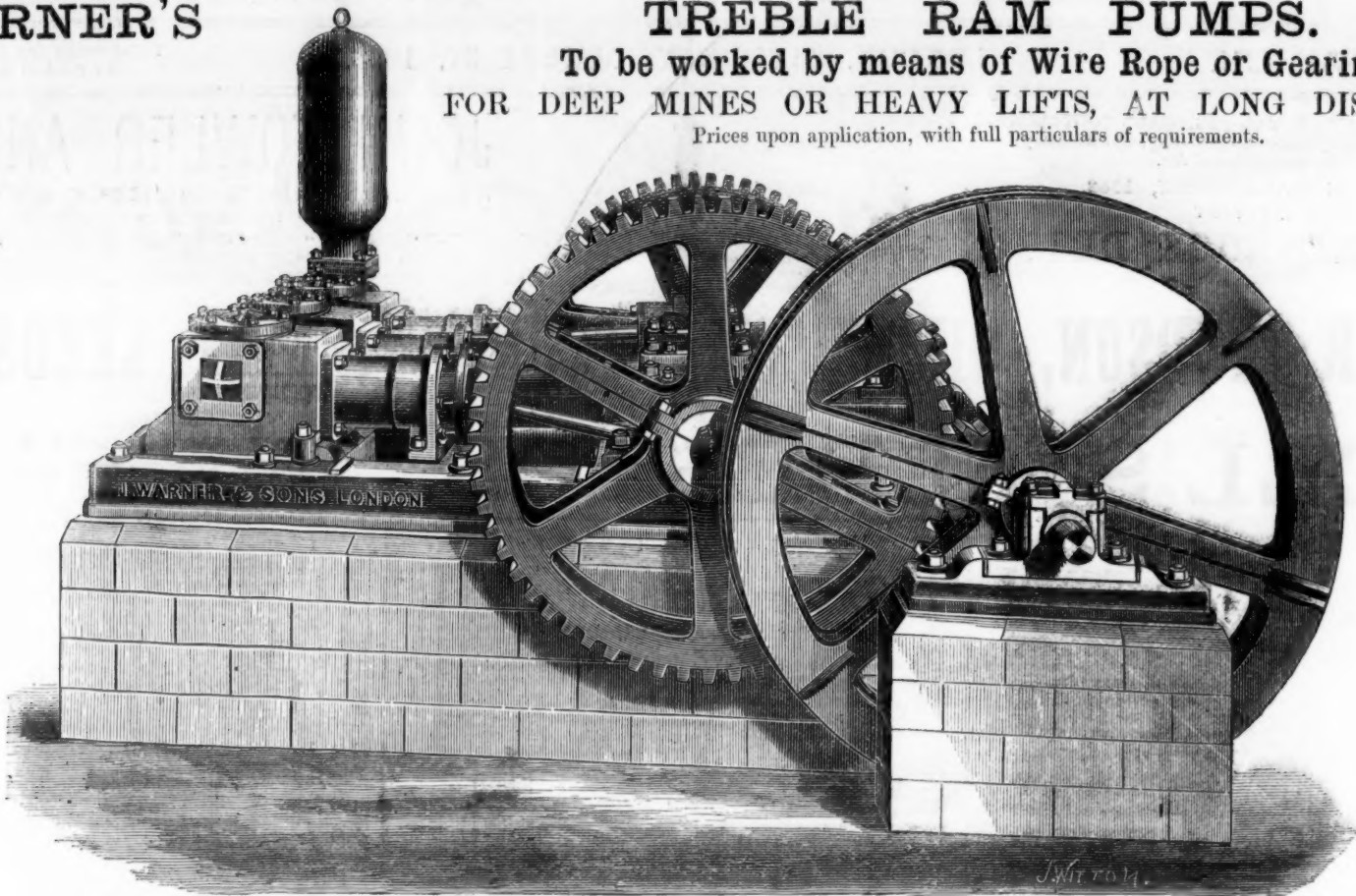


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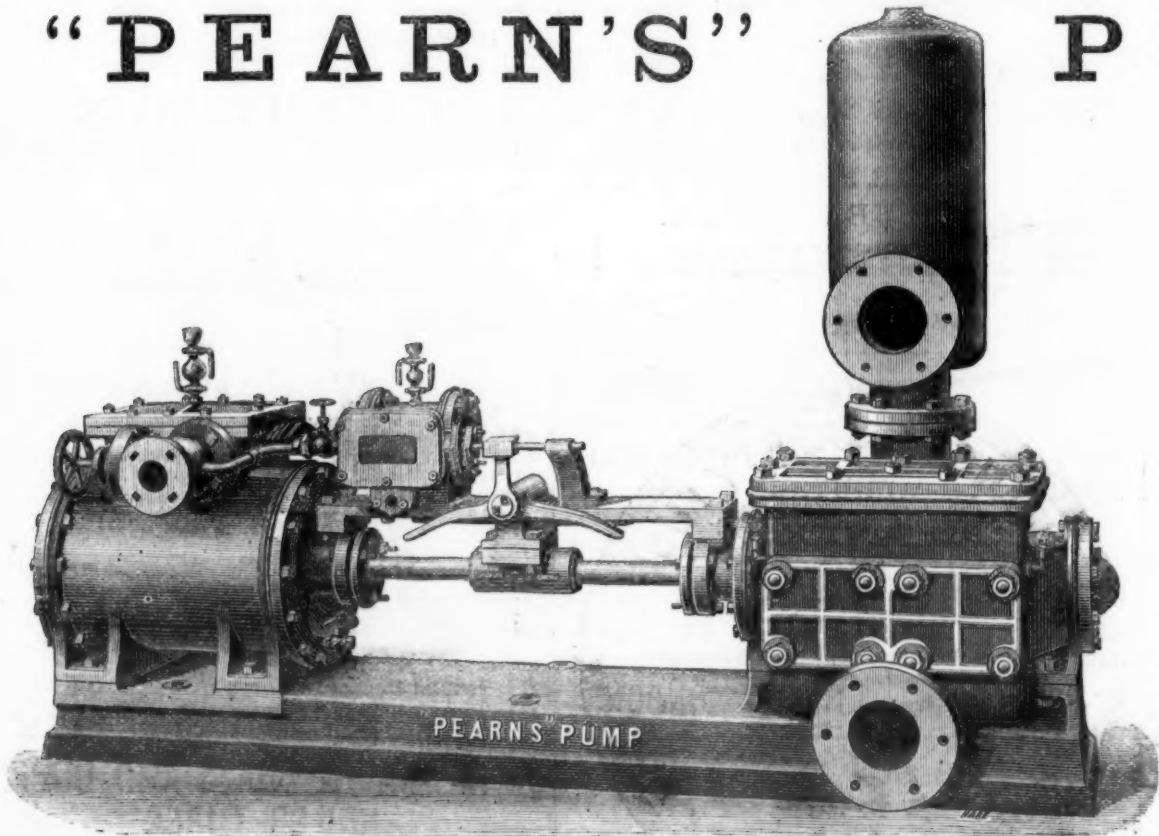
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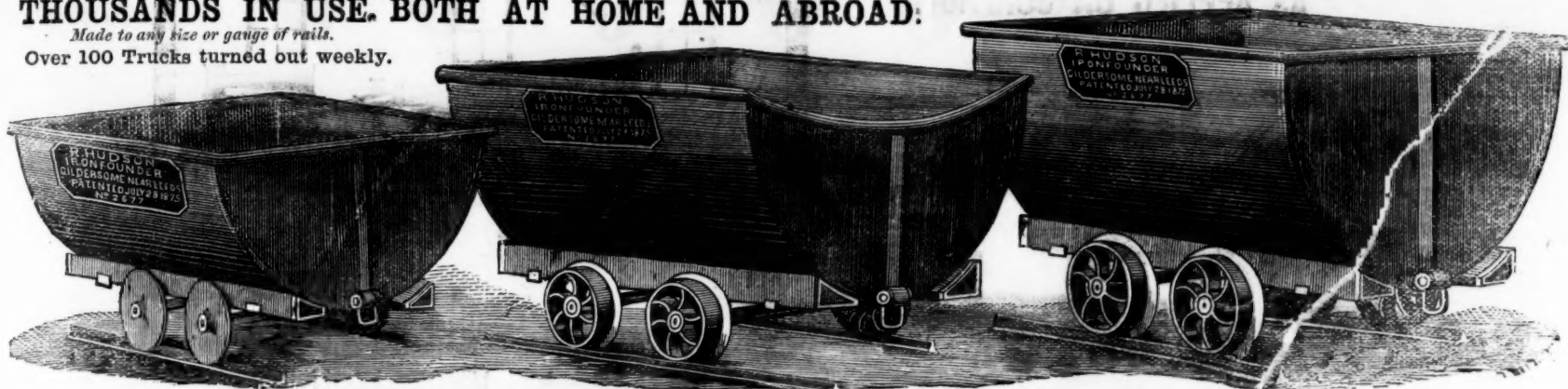
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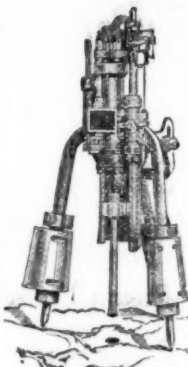
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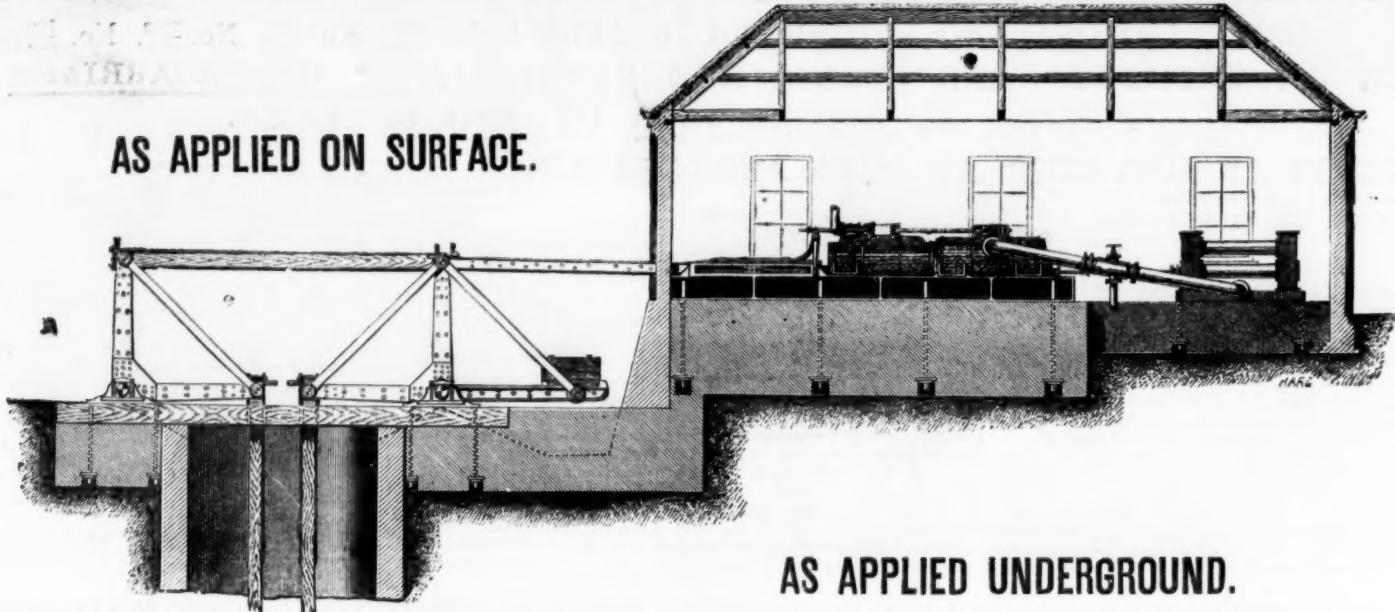
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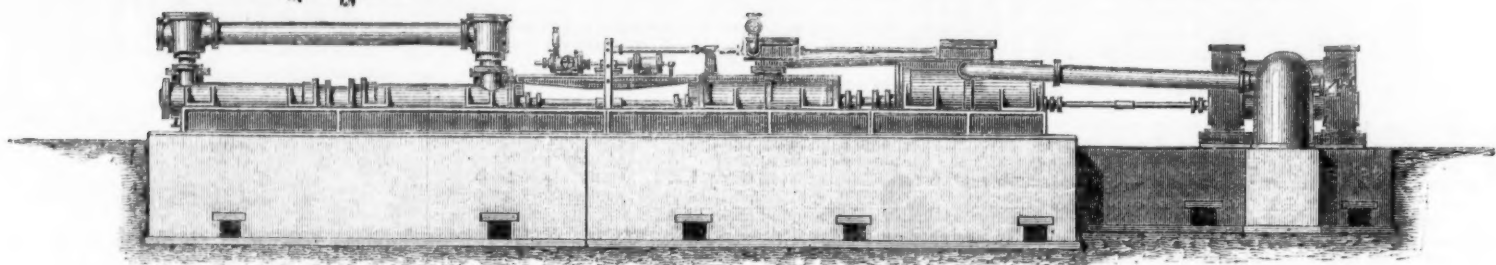
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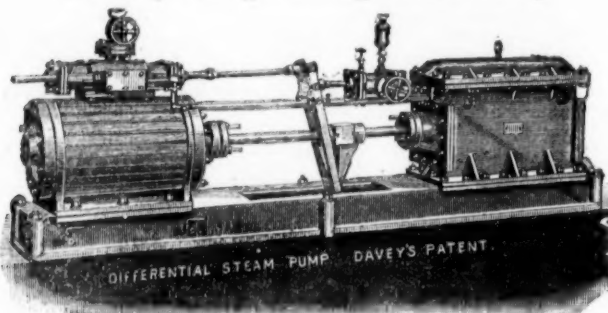


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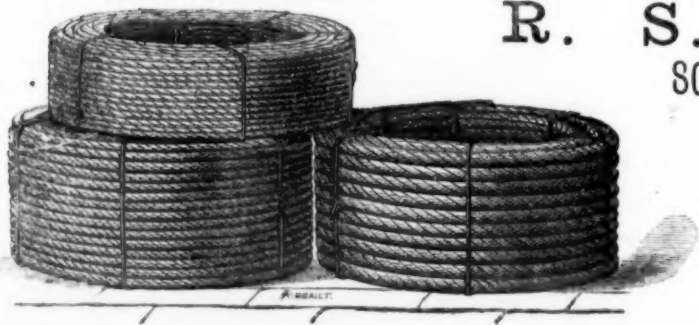
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12	6	24	6,500	250	90	104	130	5	2	2 1/2
12	7	24	10,500	150	96	110	136	6	2	2 1/2
12	8	24	13,500	140	100	114	142	6	2	2 1/2
12	10	24	21,300	90	120	136	175	7 1/2	2	2 1/2
14	7	24	10,400	250	110	130	156	5 1/2	2 1/2	3
14	8	24	13,500	190	120	145	165	6	2 1/2	3
14	9	24	17,300	150	130	150	172	6 1/2	2 1/2	3
14	10	24	21,300	120	140	162	190	7 1/2	2 1/2	3
14	12	24	30,800	80	160	190	216	9	2 1/2	3
16	8	24	13,500	250	140	170	195	6	3	3 1/2
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CANNON STEEL WORKS, SHEFFIELD.

THE GOLD FIELDS OF THE TRANSVAAL.

The announcement in the *Mining Journal*, of March 17, that the Transvaal Gold Fields were on the eve of being brought to the notice of British capitalists, with a view to their systematic development, will be received with general satisfaction, especially as it has been thoroughly demonstrated that, although hitherto the profits realised have been very uncertain, the geological conditions are such as to justify the sanguine expectations of the gold prospector. In discovering the auriferous wealth of a new country success is necessarily dependent to a large extent upon the skill, judgment, and experience as a field geologist of the man who undertakes the prospecting, and the details now available with regard to the Transvaal cannot but be regarded as more than usually conclusive, since the work has been undertaken by Mr. W. H. Penning, F.G.S., who has not only had considerable experience as an officer of H.M. Geological Survey of England, but is also the author of a volume on Field Geology, which has been recognised as a text-book on the subject ever since its first publication some seven years ago. It may be that the practical miners who first expended their efforts in seeking the auriferous wealth of the Transvaal were unsuccessful, owing to their lack of geological knowledge, for the mining engineers who have recently visited the country, and availed themselves of such facts as Mr. Penning directs attention to, have discovered such undoubted evidence of great auriferous wealth as to afford capitalists full justification for undertaking its thorough development.

The presence of Mr. Penning in South Africa gave him perhaps a better opportunity of applying the knowledge of field geology which he possessed to practical commercial purpose, and of this opportunity he seems to have taken full advantage. We have seen, he remarks, that hitherto the Kaap Gold Fields have been practically a failure, not because gold does not exist thereabouts—for it does, and in large quantities—but thus far its precise situation has not been discovered. The lowest strata observed in the Kaap Valley consists of a series of soft argillaceous shales of "slates," so greatly tilted as to be found in some places almost in a vertical position. These beds were originally horizontal, being clay deposited by water; they have since been greatly metamorphosed by heat and pressure of many hundreds of feet of rock accumulated above them. That the bearing of his facts may be readily understood, it is mentioned that Mr. J. Arthur Phillips, than whom no better authority could be named, says that "native gold *in situ* is most frequently met with in quartz veins intersecting metamorphic rocks," and that "the metamorphic rocks inclosing gold veins are mostly chloritic, talcose, and argillaceous slates—auriferous veins also occur in granite." These slates, traversed by dykes of granite, are said to form the surface rocks in Swaziland and along the border of the Transvaal, which follows the southern boundary of the Kaap Valley. If this be so the region offers a tempting field to prospectors, not only for alluvial gold (as hereafter to be suggested), but also for lodes containing gold and other valuable metals. After referring to the numerous quartz reefs, some proved to be auriferous, which have been found both in the Kaap Valley and near to Pretoria, he states that in certain portions of the Godwan Plateau, and near its eastern edge, are some remnants of what must have been formerly a very extensive deposit of sandstone, probably of the age of the coal measures. These are seen to be when broken white crystalline sandstone, grit, and conglomerate, which weather to a grey colour, and now broken up into large lumps form the boulders beneath which the gold nuggets were found. The sandstones also are traversed by veins of quartz, in some places highly ferruginous, and these, or some of these, have been proved to contain gold, but up to the present time very little work has been done upon the reefs in either of the formations described. The occurrence of these groups of rocks, which are known to enclose auriferous veins elsewhere, and the prevalence of quartz veins and trap dykes running in various directions, render the geology of the district important to the question under consideration. The first series of rocks described are doubtless of lower or older palaeozoic age; the second probably belong to the newest rocks of that period, or the oldest of the upper palaeozoic; the third are, in Mr. Penning's opinion, certainly of that age, upper palaeozoic, and belong to the carboniferous series.

The opinion expressed by Forbes is speaking of Australia—"It is useless to waste time in searching for gold in the older tertiary or in secondary rocks. . . . The older palaeozoic, the metamorphic rocks that lie beneath them, and the newest tertiary, all taken in connection with mountain chains, are the best guides in this matter"—is very reasonably assumed by Mr. Penning to be equally applicable to the geology of South Africa. Thus then, he continues, we have ample reason for concluding from geological evidence that gold may be expected to occur in reefs on the Godwan Plateau, in the Kaap Valley and in Swaziland; its probable occurrence in alluvium is referred to further on. Let us now see what bearing the gold found has upon this point, and whether its indications may not possibly be of more value than that of the gold itself. In four different spots, a mile or two apart, gold nuggets of good size have been found at or near the surface of the ground. These spots are all in small valleys or depressions, down which water runs or has recently run, westward to the Eland's Spruit. Proceeding westward from the points indicated, that is with the fall, nuggets are still found, but not of the same size. Further still, coarse gold or small nuggets, until at a distance of 200 or 300 yards it ceases altogether. But east of the spots where large nuggets occur no gold whatever is found. The natural inference is that these nuggets have been derived from a rich reef which must pass through or close to the points described, an inference which is strengthened by the fact of all the points being on a nearly north and south line, and of nuggets having been found at another intermediate point on the same line; but here it is in a rugged gully, running east to the Kaap, which has not yet been fully examined. The trap dykes also follow a nearly north and south line, cutting through the stratified rocks and their quartz veins, and the logical conclusions from the facts before us are these: An igneous dyke runs north from the Kantoor, along or near to the edge of the Godwan Plateau—it has formed what are known as contact lodes along its junction with the stratified rocks, or parallel to its contact at no great distance—this lode may bear various metals, but is peculiarly rich in gold where the dyke has intersected a pre-existing auriferous quartz vein, as at the four points where large nuggets have been discovered.

In the search for good alluvial fields Mr. Penning considers that the ancient lines of drainage are probably more worthy than the modern of investigation. It is well known that rivers slowly, but constantly, change their courses as they cut their channels to a greater depth; and he adds that, therefore, when we note the great depth of the river-valleys of this region, we cannot fail to be struck with the marvellous changes that must have slowly taken place in their courses during the process of excavation. Hence it is that miles away from the present streams we find old river-drifts on the tops of hills, and gradually nearer to them at lower levels, terraces of the same material. In these old gravel patches and terraces gold will be found, and probably in payable quantity, wherever they occur in the ancient lines of drainage from the reefs of the plateau. Other gold reefs, no doubt, occur at the lower levels. Therefore, it may be confidently asserted that good alluvial ground will be found when the seasons permit, in the valleys of either, or both, the Kaap and the Crocodile River. The mining engineer and practical miner naturally follow the geological explorer, and it must be particularly gratifying to those interested in the Transvaal to find that the views of Mr. Penning are fully confirmed by the engineers sent out by the South African Syndicate to investigate the metalliferous value of the 2,000,000 acres of land for the purchase of which they have been negotiating. It appears that in order to procure absolutely independent reports they first sent out Mr. J. M. Stuart, and upon receiving information that he had made his inspection, and was on his way home, they employed two others to go over the same ground and also report. Mr. Stuart's report (which it should be explained refers to one farm only—the farm Lisbon) is now subjoined, and although sufficient time has not elapsed to permit of the contents of what may be called the check reports being known, information as to their

general tenor has been received by telegraph, and suffices to show that in all essential particulars Mr. Stuart's report is completely verified. He says:—

TO THE SOUTH AFRICAN SYNDICATE COMPANY (LIMITED).

GENTLEMEN,—In accordance with instructions, I left England on Oct. 4, 1882, and proceeded to the Farm Lisbon, situated near the centre of the Lydenburg gold fields, in the Transvaal, South Africa, and returned home on Feb. 6, 1883. During this time I made a thorough examination of the Farm Lisbon sometimes known as "Waterfall," and I have now the honour to lay before you the results of such examination.

I may add that I examined many other farms, and also investigated the geological structure of the Swazie Land, and of the country from Nata to the gold fields.

CLIMATE.—The climate of the uplands of the Transvaal is justly regarded as most healthy. The lowlands and beds of rivers are known to be unhealthy at times, in the summer months or rainy season; there is, however, no reason why anyone should venture into these regions. I am of opinion that when the wood is cut off these valleys, which are several thousand feet below the portion where the gold mines are, and where the farmers live, will become quite healthy. But the unhealthy portion of the Transvaal embraces but a small area of the territory.

RAINY SEASON.—It happened that my visit to the Transvaal was in the rainy season, which is the one considered unhealthy. I had to pass through many of the low spots of this section, especially in crossing from the Transvaal to the Limbombo Mountains and Swazie Land, and was wet through for many days at a time. But notwithstanding this my health was excellent.

GENERAL DESCRIPTION.—Immediately upon reaching the farm Lisbon, I spent a few days in examining the workings of the miners taking out gold, and in riding over the farm and becoming familiar with the geological structure of that particular portion of the country. I then employed a number of Kaffirs, so that I might test with fairness the alluvial deposits represented to be on this farm. I also directed Kaffirs to run certain tunnels into the hill, a distance of 134 ft. to cross-cut eleven veins, so that I might be certain of their paying quantity beneath the surface. While these and other works were going on, I employed my time in making fresh examinations and ascertaining if the gold formation was local, or whether it extended over a wide area of country. In doing this, I travelled several hundred miles, and I formed the opinion that no country that I have seen or heard of is so thoroughly and variously mineralised as the Transvaal. I found gold rock extending over no less than 400 square miles of territory; and I also found garnets, rubies, iron, coal, lead, silver, copper, cobalt, asbestos, mica, and cinnabar or quick-silver.

ANCIENT WORKINGS.—The discovery of gold, as far as regards the English, may take date from 1870, but I soon found that the Transvaal must have been extensively worked by the miners of ancient times. I came upon the remains of old workings, showing that centuries ago mining was carried on to a most extensive scale; that vast quantities of ore had been worked, and that by engineers of a very high order. I found quarries, tunnels, shafts, adits, the remains of well-made roads, and also piles of ore on the side of these old roads apparently ready to be put into wagons. This ore was piled with as much regularity as if it had been placed for strict measurement, and it would seem as if these workings had been abandoned precipitately by the miners. I found in one instance that a gallery had been walled up with solid masonry. I could not conjecture the reason for this, but it may have been walled up by the miners themselves, under the impression that their abandonment of the works would be but temporary, and behind it there may possibly exist a continuation of the level. I was not able to remove the wall as it was on a farm not at that time under your control. The native tribes, so far as I could ascertain by diligent enquiry, knew nothing as to who these ancient miners were, and have no traditions regarding them. I prefer to attribute these workings to the Portuguese, who are historically known to have had many trading possessions, and to have gained much gold in this section in the seventeenth century. My reason for so attributing these workings is that they were acquainted with the use of gunpowder. But whether even a more ancient people, such as the Phenicians, or whether the Portuguese did this work is immaterial. The fact remains, and is open to all who will visit this country, that mining on a very extensive scale was carried on by some nation in the past.

SECURITY OF LAND.—The integrity of the Boer Government as to titles is beyond dispute; in fact, I think their land system and mode of conveyancing are simple and perfect. I found, on my arrival, that the farms Lisbon and Berlin, or Drenth, were in conflict as to the boundary lines, owing to the inspectors not being certain as to which hill they had taken for a beacon in the original inspection. I took but little interest in this dispute, but it led me to make a thorough investigation of the land system, land titles, and the safety of investment in land in the Transvaal.

My reason for taking but little interest in this dispute was that should the boundaries prove to be wrong, and the farm Berlin cut off a portion of Lisbon, there would yet remain sufficient mineral on the farm Lisbon to justify all that I understand you propose to do with it in the way of capitalisation. But now that the owners of Berlin have sold to the owners of the farm Lisbon, and this has become one property, and all under your control, it is the same as if the dispute had never occurred, except that you have some 12,000 acres more land, which carries the same mineral belt that runs through the farm Lisbon, as well as the undisputed control of all the water.

I shall use the word Lisbon hereafter to signify all that is included in the several farms known as Berlin, Waterfall, Drenth, and Lisbon.

This farm originally belonged to Thomas McLachlan, who acquired his title from the Government, and in 1872 it was bought by H. G. Owen as an agricultural farm. Gold having about that time been discovered on the farm, it was proclaimed a public gold field, held by the Government under the following restrictions and conditions—that any one who applied to the Gold Commissioner, and received a monthly or yearly licence, could work a claim 300 by 400 ft. For this licence he paid yearly an amount fixed by the local Gold Commissioner, the Government reserving the right to discontinue this licence at any time it saw fit. The licence fee was equally divided between the owner of the farm and the Government, the Government applying their half towards the support of the local government of the gold district.

After the peace was declared between England and the Boers in 1881, the Boer Government adopted a system entirely different from that which had then existed. It rescinded the proclamations on all the gold fields.

The Government adopted this policy on the ground that, theoretically, all the minerals belong to the owner of the land, subject to the rights of the Government; that the owner of the land must, before he mines upon his own property, apply to the Government for a concession, and agree to pay it a percentage on the net returns from any minerals or precious stones taken from the land. By this action every farm in the Transvaal was shut to the miners or diggers; the right to mine became vested in the owner of the land, and the Government took its place in the shape of a royalty.

I have taken this occasion to go into this matter, so that as far as this report may reach it will explain to individual miners that at present the Transvaal is not a place where they can expect to do otherwise than work as day labourers. The Government will not grant a concession to anyone but the owner of a farm, and I hope that this matter may become so thoroughly understood that individual miners may not, in any gold excitement that may follow these wonderful discoveries in the Transvaal, go there expecting to do as they did in Australia and California—take up claims for themselves.

The farm Lisbon lies in latitude 25 south, longitude 31 east, about 30 miles from the town of Lydenburg, covering an area of about 24,000 acres, through which run many streams, and containing many hills, locally known as "kopjes." It is covered with fine grasses, and is a good agricultural farm. Near the creeks timber grows to some extent, but the timber that would have to be used in mining must be brought from the Bushveld or low ground towards Delagoa Bay. The abundance of timber in the lowlands will make the wood and timber for mining purposes procurable at a reasonable rate, and

by reason of the location of the farm on the slope of the hills, there is abundance of water and ample fall for hydraulics in working the alluvial ground that exists. On much of this ground there will be, no difficulty in procuring a head of water giving a fall of from 500 to 700 ft., being more than is required.

As to the geological formation of the farm Lisbon, the underlying formation of the hills is composed of igneous rocks. The whole of the surface rocks are stratified, and are generally metamorphic. These rocks, in which I could find no trace of fossils, was somewhat of a softer and more friable nature than those of a similar series in America and elsewhere. These strata are in many places broken through by dolomite and basaltic rocks. I examined some very fine sections of granite, syenite, trap, and different varieties of hornblende rock, at various points on or near the farm Lisbon.

The formation on the summit of the hills, and on the plateaus of the highlands, consists of sandstone, interspersed here and there with small crystals of quartz. This bed varies from 50 to 200 ft. in thickness. Underlying this sandstone are strata of clay and clay-slates. These slates have a variety of shades in colour, and also differ in hardness, some being of so soft a character as to be easily shovelled out of position.

GOLD VEINS.—Running through the farm Lisbon, north-east and south-west, there are three large fissure veins which have cut through the granite and metamorphic slates. These veins crop above the surface, and can be traced for long distances.

One vein, which I shall hereafter call vein No. 1, is on the top of the hill, east of the Waterfall river. The next (No. 2) is distant down this hill 540 ft.; and the third vein (No. 3) is situated below that some 300 ft.

Running at right angles to these fissure veins are many veins, which vary in width from 1 in. to 1 ft. It is upon these veins that the greater part of the work has been done. At one point on the hill mentioned 11 veins run abruptly from the river to the summit of the hill. The miners have partially opened up, and are now washing down these veins. They are decomposed and soft, thus enabling the miners to extract the coarser gold, although by their present method of washing they lose most of the fine gold. The debris of the material already washed by them could be profitably run through a stamp mill.

These eleven veins, although narrow, are well defined, perfect and regular, as shown by diagram attached hereto. They are separated from each other by walls of slate, the softer portion of which should yield $\frac{1}{2}$ oz. per ton, and the harder portion of which, though not quite as rich, should yet pay to pass through stamp-mills.

I took 37 bags from these eleven veins, which included three bags of the slate wall rock. I selected them from various points, and was most careful that they should be fair average samples. These were taken out in the presence of the Gold Commissioner (who is also the special magistrate of the gold fields), and were sealed up by him.

These bags of ore I brought with me to England, and they were opened by Messrs. Johnson, Matthey, and Co., who took one-half of their contents, and made assays and analyses of them. A copy of their certificate is given below. No portion of this description of rock was ever saved by the miners, who were unaware of the gold contained in it until my examination disclosed to them its value. Under my directions the Kaffirs piled up during my stay on the farm many tons of this debris for future treatment by a stamp-mill.

Johnson, Matthey, and Co., Assayers and Melters to the Bank of England, Her Majesty's Mint, &c., London, E.C., Feb. 24, 1883. Certificate of Analysis for the South African Syndicate Company (Limited.)

We have carefully analysed the sample of mineral marked as under, and find the following to be the proportion in every 100 parts:—

Mark of sample.	
(Average of 11 bags and 27 samples.)	
Oxide of iron.....	41.40
Oxide of manganese	7.40
Magnesia	0.25
Sulphur	0.05
Combined water	5.00
Silicious insoluble matter	45.60
Gold, silver, and loss	0.30=100
Produce of gold	48.500
Produce of silver	3.800

Per ton of 20 cwt. of ore.
(Signed) JOHNSON, MATTHEY, AND CO.

Practically these eleven veins, with their interlaminations of slate, make one vein of 80 ft. in width.

Standing below the waterfall, and looking eastward up the hill, one can see the workings of the miners on these veins extending from the bed of the river to the topmost point of the hill, a distance of one mile, and reaching to an altitude of 750 ft. above the river level, at which point a well-constructed reservoir confines abundant water for all working purposes, conveyed there in a "race" or ditch from the Lisbon Creek on this farm, a distance of 5 miles.

From observations taken by me at other parts of the river bed I have no doubt that these eleven veins extend in depth to at least 120 ft. below the river level; but for the purpose of my present calculation I have assumed that they do not extend below that level. These eleven veins, with their slate interlaminations, constitute practically one vein 80 ft. wide, 1 mile long, and on an average 325 ft. deep. This vein has been proved by workings to a large extent at numerous points through its entire length. I estimate that there are within the area of this vein 8,750,000 tons of slate and 656,250 tons of quartz. After numerous and careful tests I am satisfied that the quartz when milled will yield 10 ozs. (say, 38 $\frac{1}{2}$) to the ton. A large number of assays made by me were very much higher than this estimate, in some instances giving for the quartz as high as 1000 oz., or 3800 $\frac{1}{2}$ to the ton. As to the slate the softer portion should yield $\frac{1}{2}$ oz., or 2 $\frac{1}{2}$ to the ton, and the harder portion $\frac{1}{4}$ oz., or 1 $\frac{1}{2}$ to the ton, but in my estimate I think it safer not to attach any value to the slate. The 37 bags of ore taken out and sealed by the Gold Commissioner, and assayed by Messrs. Johnson, Matthey, and Co., as per certificate appended, showed an average assay of 48 $\frac{1}{2}$ ozs. per ton. I estimate that the average value of the whole vein matter, ore and slate together, being worked together should be 13 dwts. 21 $\frac{1}{2}$ grs. to the ton. The aggregate value of the whole ore and slate at the above valuation would be 25,324,613 $\frac{1}{2}$ sterling.

There now remains only the question of the amount of machinery which shall be put to work to reduce this ore.

This last question must of course be determined by you; but I may say that the amount of water and the facilities afforded for profitable working would justify you in putting up at least 450 stamps immediately.

The ore being in many respects similar to that of the mines at Ballarat, Australia, and the Black Hills in Dakota (U.S.A.), I would recommend the use of the same description of mills, with large numbers of stamps, so as to crush a great quantity of ore daily.

The Homestake Mining Company, in the Black Hills, has 450 head of stamps, and the average value of their ore is less than 1 $\frac{1}{2}$ per ton. Their stamps weigh 750 lbs. each, and readily crush 3 tons of ore per day per stamp head. On the Lisbon Farm, the ore being more easily crushed, a larger quantity can be milled daily.

Three tons per head of stamp would yield 8 $\frac{1}{2}$ ss. 1d. per day. I estimate that the cost of working, of mining and milling, including maintenance of mill, &c., would not exceed 12s. per ton, which is allowing 3s. more than shown by the reports of the Homestake Mine. At this rate the 8,406,250 tons of material would yield a net profit of 19,680,863 $\frac{1}{2}$.

I would direct special attention to the peculiar situation of this ground, which will enable it to be worked as an open cut, thereby avoiding the timbering of the mine; and the climate of South Africa permits of this being done.

Following will be found a more detailed description of the present workings and development of the veins on the farm:—

THE FISSURE VEINS.—No. 1 vein, on the summit of the hill, is traceable by its outcrops for fully 1500 ft., and is 12 ft. in width. This vein has walls of diorite. The quartz is hard, and but little work has been done on it, only such gold being washed from its sides as time has disintegrated from its matrix. The paddocks, or pits, which have been washed away along the top and sides of this vein

may be estimated to be about 95 ft. long, 40 ft. wide, and 10 ft. deep, exposing the character of the vein for this distance.

No. 2 vein is 540 ft. below No. 1 vein on the side of the hill crossing the Waterfall Creek, is 3 ft. wide, and has been worked for the gold that has been disintegrated by time in the same manner as vein No. 1; it can be traced on the surface for 1½ mile. There are 10 cuts, 20 ft. long, 2 ft. wide, and 7 ft. deep, cross-cutting the vein. There are also paddocks or pits along this vein, where the miners have washed the alluvial for the purpose of getting the loose gold, which paddocks measure 325 ft. long, 215 ft. wide, and 25 ft. deep; this vein is entirely in slate.

No. 3 vein is 300 ft. below vein No. 2, and is also in slate; it has a width of 31 ft. The character of the quartz is the same as in veins Nos. 1 and 2. A paddock 120 ft. long, 80 ft. wide, and 15 ft. deep has been washed from the lower side of the vein, leaving the vein standing exposed.

These three veins are parallel, the general direction being north-east and south-west, with a dip to the east of 10° from the perpendicular.

I regard these veins as sufficiently developed to justify the employment of an 80-stamp mill. From the tests made I think that the yield from these three veins may be safely regarded as ½ oz. per ton, and the cost of mining, milling, and reducing this ore, and putting it in bullion, not in excess of 12s. a ton.

These veins, which are not embraced in my estimate, compare favourably with veins of a similar character that are being profitably worked in other parts of the world.

WORKINGS, No. 1.—These workings are of various sizes, consisting of irregular paddocks, which are worked out from 25 to 85 ft. deep; the average size is 220 ft. by 350 ft., by 50 ft. deep. There are also two smaller paddocks, one 25 ft. by 85 ft., by 30 ft. deep, and one 46 ft. by 46 ft., and 35 ft. deep. To these paddocks watercourses have been constructed, and the work done shows the veins to be of the same character as on the upper workings. The water is brought from well-constructed races, taken out from the race No. 2, a plan of which is hereto appended marked exhibit (9).

WORKINGS, No. 2.—These workings consist of open paddocks covering 8 acres of ground, and having an average depth of 15 ft.

WORKINGS, No. 3. consist of a large open paddock exposing the eleven veins, from which, on vein No. 4, a tunnel has been driven in 60 ft., being 150 ft. from the commencement of the cutting, and 200 ft. from the surface of the vein on the top. The upper cut of these workings is 100 ft. high, and 120 ft. driven in along the vein, and 45 ft. wide.

These, No. 3, workings are situated 5652 ft. above the level of the sea, and 400 ft. below workings No. 4. They consist of open-cuts, large paddocks already washed, and tunnels driven on the vein.

MAIN CROSS-CUT.—The main cross-cut of No. 3 workings is 110 ft. long, 50 ft. high, and shows four veins cropping out from the slates. On three of these veins drives or tunnels have been made, consisting of tunnel No. 1, 20 ft.; tunnel No. 2, 45 feet; tunnel No. 3, 69 feet. These tunnels are well constructed, and are driven on the pay ore.

CROSS-CUT ON NO. 3 WORKINGS.—This cut is driven to strike the main vein, and is 196 ft. long, 60 ft. high, and 5 ft. wide. On this cut several tunnels have been driven on the vein; also an open cut, entirely stripping the vein to a height of 65 ft., and to a distance along the vein of 70 ft.

WORKINGS, No. 4.—These workings consist of large open cuts and tunnels driven in and on the vein. The main opening is 180 ft. high, 180 ft. wide, and 160 ft. deep. This main working has been executed entirely by the use of water. Besides this main working there are several tunnels. Tunnel No. 1 is 60 ft. in, and No. 2 is 120 ft.; No. 3, 40 ft.; also three cuts, 15 ft. by 20 ft., 18 ft. by 27 ft., and 13 ft. by 34 ft.; also open face, 10 ft. by 30 ft. Extreme northern vein No. 1 is stripped for 300 ft. in length, and has a depth of 18 ft. all in pay ore. Also on No. 3 vein, 36 ft.; on No. 4 vein, 120 ft. by 40 ft.; and upper cut, 120 ft. by 100 ft.

WATER.—The supply of water is ample for all purposes of hydraulicing and washing.

In Lisbon Creek there are 8850 miners' inches of water or 15,045,000 gallons per day, with a head of 750 ft.

In Waterfall Creek there are 12,000 miners' inches; or 204,000,000 gallons with a head of about 520 ft. to the junction of the two streams of Waterfall and Lisbon.

ALLUVIAL.—It will be seen from the foregoing reports that a great part of the farm is intersected by gold veins or covered by alluvial deposits, and that water is at disposal at a suitable height for working the entire property by means of hydraulics. Works should be commenced at the lowest point at the bed of the creek, which is 1000 ft. below the upper workings, and from which point, with hydraulic machinery, the entire payable portion of the hill can be washed readily.

The alluvial will average 15 ft. in depth, and I estimate that there is not less than 300 acres of this gold-bearing ground. Careful tests on my part by panning lead me to the conclusion that the mass will pay from 1s. to 7s. to the cubic yard; and with the amount of water available, and the natural facilities which the lay of ground affords, there would be no difficulty in hydraulicing 80,000 cubic yards per day.

Special observation is called to the distinction between this alluvial ground and the ordinary hydraulic claims of California. In California the gravel and gold are worn smooth and rounded by their long travel, while here the detritus of the veins has been deposited on the side of the hill, not having travelled far enough for the gravel and gold to be worn smooth and round. This, however, is an advantage over the gravel and gold thus worn. The gold, as per the samples delivered to you, being angular, will the more readily be caught in the riffles.

ALLUVIAL WORKINGS.—These extend over an area of about 15 acres, having an average depth of 15 ft., and consist of open paddocks of irregular shape, scattered at various points along the side of the hill, and beneath the eleven veins. These workings have been constructed by several miners, having in their employ 50 to 60 Kaffirs.

Throughout the entire working of these mines none of the vast quantities of ore have been saved for treatment; ore has simply been washed out of its place, rolled over by the water, and intermingled with the slates and debris. This quartz could all be most profitably worked. It is surprising that the miners failed to discover the great value of the ore which they were daily discarding.

ESTIMATE OF THE WORKING RESULTS OBTAINABLE BY HYDRAULIC MINING ON LISBON FARM.

It will be seen from what has been already stated that there are on this farm 20,000 miners' inches of water, with a fall from the top of the hill to the bed of the river, of 700 ft.; but for the purposes of this report we will take only 10,000 miners' inches under a pressure of 300 ft. As one miner's inch at this pressure will easily wash 4 cubic yards of alluvial ground we shall thus wash a daily total of 40,000 cubic yards of a value ranging, as before stated, from 1s. to 7s. per cubic yard, and this, at the minimum value of 1s. per cubic yard, would yield 2000*l.* Deducting 30 per cent. as a maximum estimate for expenses, we should get a net profit of 1400*l.* a day, or 420,000*l.* for the year of 300 working days.

Should the entire water force be employed, the result would be increased to 840,000*l.* a year.

Attached hereto is a tabular statement of actual working results obtained from claims worked on the hydraulic system, which is found to be more economical than any other class of mining operations.

In gravel mining, water will move one-third its weight 800 miners' inches under 100 ft. head or pressure, working for 10 hours=800 10-ft. cubes of water=800,000 cubic feet, weighing 24,880 tons (without adding the pressure arising from the head), will move through ordinary sluice grades of 8 to 12 in. decline, for each 16 ft. in length, 3000 cubic yards of loosened gravel, or 2000 cubic yards of ordinary uncemented bank gravel (say) an average of 2500 cubic yards, weighing 3750 tons.

I should advise the immediate employment of 1 mile of 22-in. iron piping, and 400 ft. of 36-in. with two Little Giant nozzles, each furnished with three adjustable nozzles of 5, 6, and 9 in. respectively. With this amount of machinery the farm can at once be put in proper working condition.

Attached is a statement of some of the working results of hydraulic mining in California, U.S.A.:

Cubic Yards Worked.	No. of Years Worked.	Total Yield.			Total Expenses.			Total Cost per Cubic Yard.	Average Cost per Cubic Yard.	Yield per Cubic Yard.	Yield per Miner's Inch.	Cubic Yards Moved per Inch of Water.	Average Pressure of Water.	Height of Bank.
		£	s.	d.	£	s.	d.							
683,247	3	9,480	1	1	5409	0	9	1.90	2.35	3.33	6.0	1.80	74	45
196,682	1	1,908	19	5	1,500	0	0	1.50		2.33	4.0	1.76		30
155,347	2	4,207	6	3	1,556	13	5	1.90		6.60	18.5	2.89		90
284,932	1	9,937	0	1	1,294	11	2	2.00		6.66	11.5	1.37		28
676,968	3	18,785	17	3	3,885	4	1	3.15		6.66	7.0	1.08		30

CONTACT VEINS.—At the south eastern end of Lisbon farm is situated a hill, or koppe. Here I found a description of contact veins which has not yet been developed, and I recommend that it be opened at once. It reveals the same character of mineral (chiefly oxide of iron carrying gold), as the contact veins generally found in this district.

RACES.

On Lisbon farm there are 11 miles of well constructed races, taking the water from Lisbon Creek and Waterfall river.

Race No. 1.—This race has been taken out near the head of the Lisbon Creek, and is 1½ miles in length. It is well constructed, and has a depth of 3 ft. 6 in., with a width of 3 ft. It carries eight head of water of 45 miners' inches per head, and has been brought to the highest point of the Lisbon farm, commanding the entire hills and valleys not only on the farm in question, but also on several of the adjoining farms. This race empties itself into a well constructed dam, most substantially built on the brow of the hill. This dam and race I consider an excellent piece of engineering work. The dimensions of the dam are 108 ft. wide, and 110 ft. long. It holds an aggregate depth of 18 ft. of water; its walls or banks are 4 ft. thick, and supported by four stone buttresses, built on the slope of the hill. It is well supplied with gates for regulating the supply of water, and with floodgates for carrying away the surplus water. Its outlet also has gates of suitable size for conducting the water to any desired portion of the workings.

Race No. 2.—This race is well constructed, and is situated 500 ft. below race No. 1. The water is carried from the Waterfall river above the waterfall. The dimensions of the race are 2 ft. deep, and 3 ft. wide. It carries six heads of water of 46 miners' inches per head, the water of which is utilised in washing the alluvial deposits on the farm.

Race No. 3.—This is taken out from the Lisbon Creek, 200 ft. below race No. 1, and the length is 2½ miles. It carries two heads of water of 30 miners' in. to the head. Its dimensions are 2½ ft. deep and 2 ft. wide.

Race No. 4.—This is also carried from the Waterfall Creek. It is a fairly well constructed race for general mining purposes. It is 3 miles long, 18 in. wide, and 18 in. deep, and carries two heads of water of 30 miners' inches per head.

DAMS.—Connected with these races are well constructed dams at different points on the farm. The main dam being the one just referred to, is situated on the highest point of the hill, and is of the greatest importance, as it commands a fall of 750 ft. to the lowest workings on the veins. This fall can be utilised to give the proposed hydraulic power.

TAIL RACE.—The main tail race on this property is 200 ft. long, and is situated towards the junction of the river. At the end of this race blankets are laid in the sluice box, which is 12 ft. long, 1 ft. high, and 1 ft. wide. These blankets catch some of the fine gold. This race for 200 ft. is laid with flat stones, and once every month the water is turned off, the stones taken out, and the gold collected from underneath. This gold is again washed by hand and sold in the usual way. In this primitive method of working large quantities of gold have been obtained.

KAFFIR LABOUR.—Although I was informed that the usual price for Kaffir labour was 3*l.* per month, including food, yet I consider this a high average, as during my stay on the farm I witnessed six Kaffirs applying for employment. Two were hired for 10*l.* a month, two for 1*l.* per month, and two at 25s. a month, with the addition of three meals of corn per diem. They seemed to be strong men, tractable, and easily managed. They require only Indian corn or mealies. The amount paid to 40 Kaffirs on one farm did not exceed an average of 18s. per month per Kaffir, besides food. While on the property I witnessed several Kaffirs crushing some of the richest gold rock, which showed pieces of gold. This was done on the flat stones. I saw a few pounds of this rock yield several ounces of gold.

AGRICULTURE.—On this farm there are 60 acres of land under cultivation, chiefly consisting of crops of Indian corn. The work is done by 50 Kaffirs, who live on the property, and pay to the owner a royalty for the privilege of working the land and grazing their sheep and cattle upon it. I counted 250 head of cattle and sheep belonging to these Kaffirs, all of which were evidently in a thriving condition.

BRICKYARD.—I may mention that on this property there is situated a fine brickyard, and some 28,000 bricks are already stacked thereon ready for use.

GENERALLY.—To ascertain the probable working results with machinery I took with me a small rotary prospecting mill, and set it to work on the day of my arrival. The next day I obtained an amalgam from the mill enough to pay the entire cost thereof. This mill has since been working on the property with satisfactory results. Taking into consideration the quantity of gold-bearing matter, the cheapness of labour, the favourable conditions of the climate, and the freedom of the ore from any connection with sulphur or other refractory substances, I have every confidence that these mines will

prove to be amongst the richest in the world. This is with total disregard of its immense acreage (23,000), its agricultural resources, its stock-raising advantages, and the general facilities afforded.

In making this report I have been most careful to take the actual working results of these mines, judging from the profits they have produced and are producing to the owners. I have obtained these results in various ways—from my own working on the ground, by employing Kaffirs, and by statements and affidavits of the Commissioner, who is also the special magistrate of the gold fields, and who witnessed the gold extracted, and who has made an affidavit himself thereto. I have also seen enough gold in miners' cabins to show conclusively that they have gained a large profit from their work. I may here state that none of the quartz has been worked or treated except in the most crude manner. It is only from coarse particles of gold, which have been washed from the quartz, that the profits of the miners have been derived. I consider this property exceptional in point of richness, and it should give immediate returns upon a liberal capital expended in machinery and development.

DESCRIPTION OF PLATES.

Exhibit 1.—This plate shows the general geological sections of the several farms of Waterfall and neighbourhood. It shows the different positions in which the gold veins occur, they being marked by a tint of yellow.

Exhibit 2.—This shows some old workings. It shows that the entire side of the hill had been taken away, and that a wagon-road had been constructed for that purpose. The work no doubt was done about two centuries ago.

Exhibit 3.—This plan shows the systematic working of some old works.

Exhibit 4.—This plan shows a longitudinal section of an open gallery in the old workings.

Exhibit 5.—Shows a section of one of these workings with a tunnel driven along the line of contact, and galleries systematically sunk in basaltic rocks.

Exhibit 6.—This plan shows old workings of the same date, with the ore piled at the mouth of the shaft as it had been left; also masonry work constructed in the drift.

Exhibit 7.—This shows the section of the upper workings of the Waterfall property. It shows the gold vein striking through the different varieties of stratified rocks, which are indicated by different varieties of colour.

Exhibit 8.—This shows the No. 4 workings, with a tunnel driving on the vein; it also shows, by the tinted colour, the ground already washed.

Exhibit 9.—This shows a section of the upper workings on the Waterfall Farm, where an open cut has been made, and the ground washed therefrom.

Exhibit 10.—This shows a ground plan of cut No. 2 on the Waterfall property, and the position of the veins washed.

Exhibit 11.—This plan shows the eleven veins which are worked and cut by sluices on the Waterfall property.

Exhibit 12.—This shows a bird's-eye view of one of the main veins on Waterfall. It also shows the height of the workings which have been entirely done with water from the sluice.

Exhibit 13.—This shows a general view of the eleven veins already opened up in the upper workings of the property.

In conclusion, I have to state that should you decide to erect 450 head of stamps on the farm, you could then treat 1350 tons of quartz and slate per day, which at 13 dwts. 21½ grains of gold to the ton, and reckoning gold to be worth 3*l.* 17s. 6d. per oz., would equal 3634*l.* Deducting from this amount the cost of working (say) 12s. per ton, equal to 810*l.*, you have a net profit of 2824*l.* a day, or 847,200*l.* for the year of 300 working days, without taking into consideration the estimated net yield of 420,000*l.* from the alluvial grounds.

All the estimates here presented are based on actual working results taken at the lowest possible figure, and, therefore—taking into consideration the healthiness of the climate, the abundance of water for all purposes, the watercourses already constructed which can at once be utilised; the abundance of high grade ore, its freedom for milling, and the softness of the country rock; the openings at present being worked and the more extensive ancient openings in the immediate vicinity, together with cheapness and efficiency of native labour, and the great agricultural and grazing facilities—I can state with confidence that this property may fairly be considered to be a going concern, and I have no doubt that, with the necessary machinery on the ground, in the space of one year it will place the company in a position to pay dividends.

All of which is respectfully submitted.

JOHN M. STUART, Consulting Mining Engineer.
11, Queen Victoria-street, London.

SEPARATING METALLIC ORES FROM THEIR GANGUE.

Many attempts have been made to effect the separation of minerals from their accompanying gangue by means of water and also by means of air, but up to the present time, and more especially in the case of gold and gold sulphides, whether treated by water, mercury, or other processes, either the percentage of loss in the operation has been very large, or the expense very considerable; but by the method invented by Mr. T. S. G. KIRKPATRICK, of Eccleston-square, he claims that he is able to produce a result, in the case of ores containing gold and gold sulphides, equal to, or within a fraction of, the result obtained by fire-assay of the sample of raw mineral treated, and at a very trifling cost. The invention consists in a peculiar and improved method of winnowing the ore for the purpose of separating particles of different densities, the peculiar feature of this method being that the ore is caused by its own gravity to be repeatedly presented in thin loose streams, to a steady and continuous ascending current of air, drawn through the descending or falling ore by exhaustion, and of a strength regulated at will, to suit the character of the minerals under treatment, whereas all previous attempts to separate the ore from the gangue by means of air have been based on jiggling the ore on sieves by varying or intermittent puffs of air, compressed or otherwise, forced through a comparatively large and dense bulk of crushed ore reposing on screens or sieves.

In carrying his invention out in practice the ore is dry-crushed by any suitable mechanical process, and is separated by sieves into three or more sizes, according to the quality of the ore and the character of the matrix. Each parcel of different sized ore is then winnowed separately, by being passed through a machine so constructed as to repeatedly present the ore in thin loose streams falling by gravity into upwardly directed currents of air which separate and carry off the less dense worthless particles, leaving the metallic constituents of the ore to be collected, as the operator may determine, in one, two, or several parcels, if there be a sufficient variety and quantity of base metals present in the ore to render such a separation worth while; the machine being capable of being regulated with great exactitude by a simple mechanical contrivance to suit the class of ore or gangue in each particular case, and the whole process being conducted automatically at a minimum cost. He observes in passing that it is better to under, rather than over, dress the ore, as the presence of a small amount of gangue in the product is of far less importance than the loss of valuable mineral dust which might be carried away to the exhaust by too fine dressing. The ore, after being concentrated as above described, is treated by an approved method for the extraction of the metals it may contain.

In the case of some minerals the lighter portion is the more valuable (coal for instance, of which millions of tons are annually left for waste in consequence of mixture with heavier gangue), and the principle of this invention is equally applicable. The machine for winnowing the ore is provided with means for receiving, screening, feeding, and distributing the crushed ore for the purpose of submitting it to the air current, and it is constructed principally of a successive series of vertically or upwardly directed exhaust passages, whereinto the ore is caused to fall in thin loose streams, being conducted from one to the next by suitable shoots and openings, and in which it is met by upwardly directed currents of air produced by the suction of an exhaust fan. The machine can be so regulated as to treat each separate sized parcel of sieved ore, and is provided with

a settling chamber having a number of compartments, in which the more or less fine but dense particles which may be partially separated by the current of air are deposited, such compartments being provided with an automatic delivery of the concentrated produce into receivers, which can be kept locked, and thus secured under the absolute control of the operator or manager, a point of the first importance in the manipulation of ores containing the precious metals.

Original Correspondence.

COLORADO—METEOROLOGICAL.—No. XXI.

"The icicles hung from the eaves of our cabin
And the streams were bound by the frost."

An idea is prevalent that the winters are so severe up here in the mountains as to render this part of the country almost unliveable, that the climate is truly inhospitable in every way; this is altogether a most egregious mistake, and has a tendency to frighten people away, especially those who have a desire to make it a permanent residence as well as a place of business; to correct this misconception I will take Alma as a datum, it being the loftiest town at the foot of the mountains of Park county, its elevation is 9750 ft. above sea level, or 4646 ft. below the height of Mont Lincoln, being about the same as the convent on Mont St. Bernard, which is 9734 ft. Mont Lincoln is 14,396 ft. The highest mine in working is the Gertrude, which is 13,064 ft., and although the altitude is very great yet the miners make no complaint, and work contentedly all the winter. I have lived here for seven years, out of which time I dwelt for two years, winter and summer, on Mont Cross, the next mountain to Lincoln, its average elevation is 13,250 ft., the dwelling and mine houses of Dolly Varden and Moose are 3360 ft. above the valley of the Platte River. For one entire year I made an accurate meteorological record—morning, noon, sunset, and midnight—the report of which has been published in the Transactions of the Medical College at Philadelphia during the recent exposition. I am, therefore, supposed to know something about the climate and its effects on the human system here, both on mountain and plains. The winter set in very early, a small fall of snow commenced about the middle of November, the weather was not cold until up to Christmas, ranging only a trifle below freezing point, occasionally a little sprinkling of hail and sleet fell, no travel was impeded. On Jan. 1 it began to get much colder, and about the 5th the hard frost set in, the temperature even here was very low; in the eastern and north-western States remarkably so. My correspondents write complaining sadly of the cold; on the 7th the thermometer stood 20° below zero at Chicago; in Iowa and Nebraska, 25° below; Wisconsin, 30° below; Dakota and Michigan, 40° below; the same in Canada West; in New York and Massachusetts from 20° to 25° below; in Colorado for one week the average was 4° below; west of the rocky mountains it was a very little below zero. The following table is compiled from observations taken at my office in Alma for the past two months, which may be said to be mid-winter only the days noted here were very cold ones. It is sufficient to estimate climatic influences, the intermediate days were warm and sunshiny:—

ABSTRACT OF REGISTER.

Month.	Daybreak.	Daytime.	Sunset.	Wind.	Ozone.
January					
1	2° below	20° above	5° above	NNW	3½
2	10 above	30 "	12 "	NN	3
3	1 below	34 "	10 "	N by W	3½
7	0 above	25 "	12 "	N	3
15	3 below	40 "	15 "	NW by W	4
19	10 "	18 "	0 "	N by E	3½
20	18 "	10 "	12° below	N by W	4
21	0 above	10 "	0 "	NW	9
23	0 "	36 "	12 "	NE by N	6
24	26 "	38 "	28 "	N by W	4½
27	2 "	34 "	12 "	NNW	4
29	21 "	40 "	20 "	NNW	5
30	10 "	30 "	10 "	NW	9½
February					
1	30° above	50° above	0° below	NNW	4½
3	3 below	15 "	0 "	N	4
5	4 "	30 "	15 "	NNW	4½
6	8 "	20 "	10 "	N by W	4
7	0 above	33 "	12 "	NW by N	4
8	4 below	30 "	10 "	NW	4
9	0 above	36 "	20 "	N by W	4
12	0 "	40 "	15 "	NNW	4
15	12 "	50 "	20 "	N	6½
16	10 below	20 "	8 "	NW	5
17	0 above	36 "	15 "	NE by N	4½
20	12 "	60 "	22 "	NW by N	3½
23	20 "	50 "	30 "	NW	3
25	0 "	36 "	26 "	NW by N	3
26	0 "	40 "	20 "	NW by N	3
28	0 "	48 "	24 "	NNW	3

In this time there has been only three stormy days, each accompanied with a blustering northerly wind, and snow only twice; at the first 10 in. fell, the second time 6 in. While I am writing now it has nearly all melted away in the valley, and the mountains are quite bare in many places on the southern slopes, even in the gulches and in the heavy timber, where it is generally deep, there is not on an average more than 15 in. Buckskin Creek continues to flow under the ice, with about one-third its general volume, until it gets down to the forks near the town where it breaks up through the crust and flows over, it has formed an ice yield of many acres in extent, in some places it is 5 ft. thick solid ice. The general health of the inhabitants is excellent. The St. Nicholas Hotel, the chief one, is closed for two months on account of an absence of transient visitors and many of the mine managers, but there are four others of second class still open.

OSONE.—I do not know of anyone but myself in Colorado, except the officer of the Government Signal Office, who keeps a register of this peculiar property in the oxygen of the atmosphere. I have done it for several years, I find it a good monitor, for its warning you of what to avoid, and plainly tells you what to do. The system of measuring is by a graduated scale arranged in 10 divisions; each of these are tinted a reddish blue-brown colour which corresponds with the ozone itself. They begin at top with a nearly invisible shade, which is 0° or zero, then increases darker and darker until the bottom is reached, where it is nearly black, this is 10°, and the extent of the scale; 0° shows there is no ozone in the atmosphere, and 10° there is an excess; we use strips of bibulous paper cut 3 in. long by ½ in. wide, they are prepared thus:—In 100 ozs. of distilled water dissolve ½ oz. of pure iodide of potassium, and in it put when lukewarm, 5 ozs. of perfectly white starch, incorporate the mixture well by frequent stirring; rice starch is the best, but either must be free from indigo or any other colouring matter, dry them on strings or cotton thread in a close room, when perfectly dry tie them up in bundles of a dozen each, and pack them in a wide-mouthed glass jar having a ground stopper—this is essential as there must not be any access of air, they are then placed away in a dark place. I use tin cans with a tight fitting rimmed lid, no light can pass through these, and the air is also excluded. When wanted for use take out one of the bundles and close the lid quickly, if the prepared paper was dried in vacuo the quality would be improved. I have recently had some ozone cotton cloth sent me by one of the professors of the laboratory of the School of Mines; it stands better in a hard blowing humid wind than soft paper, but is not so sensitive as that of my own make. In using the strips dip them in a glass of pure clean water, rain or snow water is best, spring or well water if it contains the least lime should be avoided, tack the strips on a board, allowing one end to swing free in the wind, on the same board fasten a thermometer, and hang the board up on the shady side of the house, if it is in the sun the thermometer will not record the mean tempera-

ture, then on a card write down the hour of the day the test paper was put up, also the temperature at the time, the direction of the wind and its speed, in six hours take off one of the strips, and immerse it for a quarter of a minute in cold water, and the ozone colour will instantly appear; you now lay the strip in its wet state on the scale, moving it down until the colour of the paper corresponds with one of the coloured divisions of the scale, and on which is printed the number of degrees. This is the true measurement of the quantity of ozone in the air at that time and place, it being the accumulation obtained in the first six hours of the day; being myself an early riser and a late go-to-bed, when in good health and daily practice, I arrange my ozone board at sunrise, which at this time of the year is six o'clock in the morning, at noon I clip off a piece of one of the strips with a pair of scissors, and ascertain the quantity collected, entering the same as well as the temperature and wind gauge in a book kept for the purpose. I repeat this at sunset and midnight before going to bed, and in the morning I have a full registration of what ozone has been in the atmosphere for 24 hours. When it rises rapidly, and I have known it to jump from 4½° to 9½° this winter in one night, persons with weak lungs should be very careful not to expose themselves to a cold wind, and in going out of doors to wrap themselves up in warm clothing, and cover the chest with thick flannel; the most healthy state of the air is when the ozone is steady at 3½°, when at 6° it begins to irritate the respiratory organs, is bad for all pulmonary complaints, brings on violent coughing, at 7° those who have catarrh suffer much, at 8½° it is dangerous; different persons are effected in different ways, with myself I am severely afflicted with a kidney complaint and rheumatism when the rise is sudden, but on a subsidence both leave me, it rarely lasts more than 36 hours, then I am well again; my body is a kind of barometer, for as soon as I get out of bed I can predict with an almost certainty what the ozone will be during the day; when it is very high it is sad on those afflicted with neuralgia, or any nervous weakness, it is an unerring predictor of an approaching hailstorm; This can be easily accounted for; ozone can be generated from dry oxygen by electricity very readily, now when the clouds are charged with hail, which they often are before it falls to the earth, the attrition of the particles of frozen matter produces frictional electricity, and thus sets free the ozone in the oxygen of the atmosphere. To make a truly scientific report barometrical observations must be taken, humidity measured, rainfall or melted snow gauged, magnetic variation of the place taken by the solar compass, pressure of the wind or air currents measured, negative tests should always be made where extreme accuracy is required; this is done by having a paper prepared similar to litmus, which we use in the laboratory for ascertaining the presence of acids and alkalies—it should be strongly impregnated with a salt that the ozone will decompose. In some of my experiments I have put up the ozone strips which are quite white, and by their side a negative strip made very dark in colour. When the action takes place the positive strip will increase in darkness, and the negative become lighter, one will therefore balance the other inversely; it is exceedingly interesting, especially to those fond of investigation, for the one says I give, the other one I take. During this year thus far the barometer has ranged from 29° to 29° 30', the magnetic variation is 14° 30' easterly in Alma town, and on the mountains from 14° to 15°; it much depends on local attraction, but the variation is always east—that is to say, the needle always points from 14° to 15° east of the true meridian.

Alma, March 1.

CHARLES S. RICHARDSON, G.M.E.

INDIAN GOLD MINES, AND THEIR MANAGERS.

SIR,—In the *Mining Journal* of Jan. 20 I see a letter, signed "J. M.," in which that gentleman is lavish with his condemnations. I would suggest that "J. M." (whomsoever he may be) should be better informed as to the orders of the engineer from his board before he writes against him. In this case the 20-stamps mill he mentions was sent out against my advice, I having taken the precaution of bringing out a small prospecting mill with me. When I arrived here I wrote to my board not to send out the large mill until I had prospected the whole of the property, and seen whether I considered it worth the erection of the big mill. In reply I received a letter (which is in my possession still) to the effect that although the board had given my letter great attention they had come to the conclusion that the large mill must go out and be erected at once.

As my contract bound me to obey all orders of my board I had no alternative but to receive and erect the mill; at the same time I wrote saying I was sorry they had taken such a step, but that they must take all the responsibility off my shoulders should the day ever come when the wisdom of such a proceeding might be disputed. At the same time I assured them I should obey their orders, as I was bound to, and would put up the mill as quickly as any in India had ever been erected. What has since passed I trust proves that I have fulfilled my promise to my board. As to the value of the mine my reports can no doubt be seen, and are strictly correct.

I have written this in justice to myself, and shall not comment further on your correspondent's letter, though I think it is a mistake, at the very least, that any correspondent who wishes to impugn a manager's conduct should feel it necessary to hide himself behind a *soubriquet* when writing in your valuable *Journal*.

W. R. MOORE, M.E.,

Late Managing Director Indian Kingdom and Sandhurst Gold Mining Company.

Pondalur, Feb. 28.

THE GOLD AND DIAMOND FIELDS OF SOUTH AFRICA.

SIR,—There is little change in the very unsatisfactory state of affairs here since my last. In the Kimberley formation the only companies that are hauling blue (diamond soil) are the Central, French, and South-East. I see the Central Company have called for tenders for breaking out the diamond soil and filling the buckets. Most of the respectable overseers have given notice to leave; it is only those of doubtful reputation that will submit to the indignities of the searching system, and the blacks are leaving the fields in crowds. The diamond market appears to be glutted. It is considered by competent authorities that our local stock of diamonds have accumulated to the extent of 13,000,000 carats, consequently it seems to me somewhat hopeless to look forward to any very early reaction. Illicit diamond buying appears to increase with the severity of the rules, and until the searching system is extended to the Mining Board, the managers and directors of companies, there is not the slightest chance of any very material abatement of the evil. These august bodies will strive very hard to convince the public that they are above suspicion. "They would not pocket all the best stones. Oh dear no!" The Mining Board still squabble amongst themselves, although they have not drawn revolvers on each other of late. However there appears to be a storm brewing over the amalgamation business. It cannot be wondered, if under the control of such a body, the accidents in the mine should be of such an alarming extent, and the whole concern well nigh ruined.

In the Transvaal everything is much worse than here. The concession business has been well nigh played out, and the money spent. The last importation of geologists have not been able to manufacture any gold fields, and consequently they are accused of not being masters of their profession. Mr. Nelmapius has a concession for making powder (blasting), and his party are about to commence the factory. There is certainly a fair demand for this commodity in the Transvaal, but if the sample shown to me is a fair specimen of their manufacture it can only be intended to shoot easy, and the few blacks who have not been blown up with dynamite are likely to have a much better time of it. I am of the opinion that their powder factory will be a dead failure.

The two or three payable patches of gold on the old diggings are already being fought over, and several times their real value is likely to be absorbed in judicial contests. Your readers cannot fail to observe how strictly reliable in every respect has been the information I have supplied to your valuable *Journal* relative to the reported gold fields of the Transvaal, and for so doing I have incurred the virulent hatred of a few unscrupulous adventurers; nevertheless I have the satisfaction of knowing that I have rendered valuable service to a large number of investors who rely chiefly on the *Mining Journal* as a guide. Fever at the present time is very prevalent in the Lydenburg and Fontpansburg districts. Two large imps of Boers are still

engaged in the slaughter of blacks. They are assisted by large numbers of friendly blacks who are pressed into their service in the name of England.

Cetewayo's return is Zululand is hailed with delight by everybody but John Dunn, who is said to be doing all in his power to incense the people against the restored king. If his Majesty should get hold of Dunn and hang him he would confer a blessing on that part of South Africa. I hear that Cetewayo is very indignant at being classed with the Boers. The Presidential election in the Transvaal has taken place, and although the result of the polling is not known, it is generally believed that Paul Cruger will fill the exalted post. The thermometer being about 100° in the shade, just after a shower the place is not unlike a stew-pan.

Kimberley, Feb. 22.

CORRESPONDENT.

MINING ON THE GOLD COAST.

SIR,—Being the holder of a considerable number of Guinea Coast Gold shares, I am very sorry that I cannot share the hopefulness of your correspondent, "R.," as to the future of this company. Except that there is still 15,000l. in hand, I think the prospect is about as gloomy as it well could be. Let me explain why I so think. This company was formed for the purpose of working a reef, "the samples"—not merely some samples—from which, it was alleged, gave an average of 15 ozs. of gold per ton of quartz, and it was computed that if "only 50 tons" per diem were crushed a profit of 100,000l. per annum could be obtained, even if the quartz only yielded 2 ozs. instead of 15 ozs. per ton.

Now, I greatly question whether any such reef really exists on this property at all, and these are my reasons:—1. Captain Burton, who went out to examine and report on the property, did not report that he found such a reef, though he did, I believe, send home samples of quartz which could not have been satisfactory, or the directors would certainly have informed the shareholders, and not being satisfactory they could not have come from the alleged reef, for that reef averaged 15 ozs. of gold per ton.—2. A reef has been found, and to some extent worked, for it has given the samples that Mr. Johns referred to at the meeting, samples which practically gave no gold at all. Is it credible that if the rich reef existed sane directors would waste money and time over this barren reef to the neglect of the rich one? It is to me utterly incredible.—3. Although the prospectus, in view of the alleged rich reef, stated that the directors, to save delay, had then already taken steps for procuring necessary machinery, there is in the report absolute but most significant silence about machinery; in fact, so far as appears nothing has really been done about it. Why is this, if the reef be really there? If it be not there this omission is perfectly intelligible, but otherwise it is quite unintelligible—at any rate to me.—4. Captain Burton recommended the hydraulic process, and I have reason to think it has been tried, and that the result was no gold. Now, considering that the ground workable by this process is the result of the degradation, through countless ages of the upper ground in which the reefs lie, what is the inevitable inference if no gold was found in this lower ground? That it is absent is no more than might be expected, however, when we remember the result of the assay of Mr. Johns' samples, for if his reef produces no gold how could there be any in the debris of that reef?

For the above reasons I therefore not only doubt the existence of the alleged rich reef; but I feel confident that the directors have no reliable evidence that it has any real objective existence. But if my reasoning and conclusion can be shown to be erroneous, no one will be more pleased than I shall be. I think "R." will admit that the evidence I point out is dead against the existence of the very thing in respect of which, and relying on the existence of which, the prospectus was issued, the shares taken by the public, and 43,000l. solid cash was paid to the fortunate vendor. A pretty state of things, indeed! If the directors have not up to this proved the existence of this rich reef beyond all question, then I consider that, as honest men, they are bound to state the fact frankly to the shareholders, because if it does not exist the very reason for which the company exists is gone, and the company ought to be wound up, or, at any rate, the shareholders should be called together to decide what shall be done under the circumstances. There is still enough money in hand to return 3s. in 12 to the shareholders. It is not, I know to the interest of the directors to wind up yet, for if the company can be kept afloat for a year or two longer their fees will recoup what money they have risked; but how about the other unfortunate holders of shares?

As a large shareholder I think myself justified in calling upon the directors to give me and the other shareholders at once full and precise information as to the real position of the company in regard to this vital question—the existence or non-existence of Mr. Walker's alleged rich reef. There are other important questions—that of labour, for instance—which the directors do not even allude to in the report; but it is useless to go into these until the vital question is disposed of.—St. Leonard's, March 28.

GUINEA COAST.

MINING IN NEW SOUTH WALES.

SIR,—As the Hawkins Hill Consolidated Gold Mining Company is virtually an English one now, the following details regarding its workings may be interesting to some of your readers. It is just one of that class of mines which may at any moment come across such rich deposits, that a day's work may pay for a year's expenditure, and give a good dividend also—as the country it is in is naturally a patchy one—but then in its palmy days some of these patches meant 50,000l. or 60,000l. in a block, and therefore it has always at least the possibility before it of such luck happening again. The latest official report, dated Hill End, Feb. 5, says:—"Since last report we have crushed 660 tons quartz for a yield of 340 ozs. gold. The engine-shed for the boiler and air compressor has been completed, and for some time past two of the six Eclipse rock-drills have been successfully worked at the 120 and 220 ft. levels from Herman's shaft. At the lower level have driven a cross-cut east 40 ft., through very tough ground, and now tapped a very extraordinary formation, with a large body of quartz on the foot-wall. The face of the drive going north on this formation is a splendid soft slate, with leaders through it—a good indication of gold; but so far have seen none. In the west cross-cut have broken into Paxton's workings; there is a vein standing here in places 4 ft. wide, which we are preparing to work, and if it only yields 4 dwts. per ton will pay well. We are also cross-cutting west from Rowley's vein, at a depth of 80 ft., but the ground is so hard that progress is very slow. The bulk of the hands are stopping out ground in Rapp's from the 600 down to the 660 ft. level. The vein here varies from 6 in. to 18 in. in thickness, and occasionally shows very fair gold. From the character and favourable indications of the country and the great extent of gold-bearing quartz in this locality we may expect patches of really good stone, but have to stoop out the ground to find them. At present we have nothing to indicate whether we are above, below, north or south of them, but have ample ground whichever way it makes to follow them. At this depth there is no work done in the hill to guide us. This vein is supposed to be the one known as the Lady Belmore. We are also driving north to connect Krohman's Mine at the 360 ft. level. In this drive there is a belt of slate for 40 ft. in width, intersected with a number of veins, which we purpose to test by cross-cuts east and west as we approach Krohman's boundary. With a view of picking up a continuation of the rich run of gold that company had it is intended to continue sinking the shaft from the 830 ft., the present depth, down to the 850 ft. level, and then cross-cutting west, as the last 10 ft. sunk in the shaft passed through an entire change of country, evidently indicating the proximity of another belt of veins, which at this great depth may lead to important discoveries for the future welfare of this company. Since this company took possession in May last, much of our time and labour has been absorbed fixing machinery connected with the rock drills, readjusting battery plant, erection of engineers' establishment, besides a large amount of prospecting and necessary dead work. This has limited materially the output of payable quartz up to the present; but now, with all the increased facilities and additional labour, it is expected we shall soon raise sufficient quartz to keep the battery fully occupied."

Of a different class of mine (where the reef is well defined regularly, and not specially rich, but steadily payable throughout) is

the undermentioned Queensland one, which has lately found great favour in Sydney capitalists' eyes; but that is perhaps partly also on account of the gentleman who brought it forward here—Mr. Leo F. Sachs—whose pluck and luck in both land and mining investments have made him a man of note already. His shrewdness and foresight has been certainly something beyond the common, whilst his generosity and general kindness of manner have made him so popular that even envy does not begrudge him the double plum with which he is already credited. At any rate his experience proves thus much—that with judgment, skill, and knowledge, mining is by no means the uncertain risk that it is generally held to be by the unlucky and ignorant ones.

The following telegram has been received by the North Queensland Mining Investment Company from Mr. William Burns, the newly appointed mining manager of the Hodgkinson Union Gold Mining Company, Thornborough, Queensland, Feb. 7:—"Have inspected Union Mine, and find Munday's report is a fair one, but the mine looks far better now. Under foot at bottom level reef is 2 ft. wide, carrying good gold. Mill in fair working order; 320 tons of stone at grass; cost of same from Dec. 11 to Feb. 3, 334*l*. I have examined accounts, and find above charges correct. A considerable reduction in working expenses can be effected, and the mine made a first-class dividend-paying property." This property has recently been purchased and floated into a company by several influential commercial men of this city, with a view of directly associating themselves with North Queensland mining, a class of investment which is beginning to attract considerable attention. The Hodgkinson Union Mine has already crushed 7964 tons of quartz, returning over 40,000*l*. in gold, and there is now 10,000 tons of stone in sight ready for breaking down and crushing. It is proposed to supplement the five head of stampers now engaged on the stone with additional crushing power and gold saving appliances of the most approved description.—*Sydney, February.* R. D. A.

TUCOPILLA COPPER MINING AND SMELTING COMPANY.

SIR,—In reading the letter of "Observer" in the *Mining Journal* of March 3 the question naturally arises whether the much-abused manager of the Tucopilla Mining and Smelting Company has had fair play, or a fair chance of giving the splendid results that his report on the mines led every one to expect. Can "Observer" state what was done in those mines from the time they were reported on to the time that the company's manager came to take charge of them?

Was there one piece of timber changed or put in during that time? Was not every kind of work stopped but the digging out of the best of the ore for the profit of the sellers? Surely it was a very foolish thing on the part of the Inspector to let them know that he was going to report favourably on the mines, and then to come home and leave the whole concern in their hands, with unlimited power to do what they liked with it. I believe that Mr. Tredinnick found a very different mine when he went out, to take charge, to what he did when he went out to report, and that the fact of levels coming together and men being stopped is not so much a fault of his as of the people who had the mine before he took the management. One thing I know, that if a man gets at cross purposes with a few of the old hands at Tucopilla they are sure to make it pretty hot for him, and would not be at all unlikely to tell the Chilians that the mine was in an unsafe state, just to annoy the person in charge. "Observer" comes out rather strong when writing of the enormous (?) salary of 1000*l*. a-year, with food and house—in fact so strongly that one is led to think that he feels put out at not having got it himself, and I consider it very wrong on the part of any miner—which perhaps "Observer" is not—to ever let the mining world see that he thinks a manager is gaining too much money; as I think that, as a rule, they are badly paid.

"Looker-on" also alludes in the *Journal* of March 14 to the letter of "Observer" and states that some of the candidates for a management in Bolivia had offered to learn the language on the voyage out. Without doubting this it is still hard to believe that anyone could think such a thing possible. The observations of "Looker-on" on the way in which managers and inspectors are often elected are very true, and it is so often the case that the shareholders suffer through it. At the same time I would wish to ask any of the readers of your valuable paper why men put Spanish words into reports meant for English readers, who may not be acquainted with technical terms, and who might be foolish enough to attempt to translate them with an ordinary dictionary instead of a mining glossary? Surely some holders in those mines must have a deal of difficulty in finding out through the reports the true state of the property.

March 28.

ANGLO-AMERICAN.

EXTRACTING PRECIOUS METALS FROM THEIR ORES.

SIR,—From some of the remarks which have appeared in the *Mining Journal* in the report of a meeting and in other places, one would almost imagine that there is a desire to surround the process of Messrs. Huntington and Koch for extracting the precious metals from their ores with a halo of mystery. I have, therefore, taken the trouble to watch for the issue of their specification, and so far as I can judge there is nothing in the process calculated to make the Indian gold mines remunerative, the essential feature of the invention being the extraction of the precious metal by first calcining the ore, and then subjecting it to heat and agitation in a deoxidizing atmosphere in presence of molten lead, zinc, or their equivalents. It is stated in their specification that they employ by preference a rotative gas furnace, which may be of the regenerative kind, and they provide means of the usual kind for supplying an oxidising flame by excess of air or a deoxidising flame by excess of carbonaceous matter in the gas or in the charge. This furnace they charge with the ore or tailings that are to be treated, the ore being preferably crushed so as to expose a large surface in a subdivided condition. They expose the charge to the oxidizing flame at a sufficiently elevated temperature to decompose without fusing the ore, and to separate or drive off the greater part of the sulphur or other impurity present in the ore. They then lower the heat of the furnace and introduce metallic lead or easily reducible lead ore or compounds of lead, such as oxide or carbonate. The lead when in a molten condition takes up the precious metal as an amalgam or alloy, and is afterwards separated from it by cupellation. The lead may be employed for a number of successive charges until it becomes sufficiently saturated with the extracted metal, and after cupellation the litharge produced can be used to form fresh alloy.

In practically carrying out the invention they find it more convenient to effect the amalgamation in a vessel separate from that in which the calcination of the ore is effected. Thus, when the ore is sufficiently calcined under the oxidizing flame in the rotative furnace, as they can ascertain by testing a sample taken from the furnace, they transfer it still hot to a pan or vessel, arranged as follows:—It is a close vessel set in a flue to receive heat, preferably from a gas flame. Within the vessel there is a revolving agitator, which keeps the calcined ore in agitation over a quantity of lead which is molten and occupies the lower part of the pan; a pipe leads from a gas producer to the upper part of the pan, and an outlet pipe carries the gas from the pan to the fire or furnace, where it is burnt to heat the pan. Thus, while the ore remains agitated at a temperature insufficient to frit it in the presence of the molten lead the carbonaceous or deoxidizing gas from the producer is kept circulating through the pan. The molten lead in the pan takes up the precious metal from the ore, and when the extraction is carried sufficiently far a side door of the pan is opened and the arms of the agitator throw out the residue of the ore, when a fresh charge of calcined ore can be introduced. The lead may continue in the pan to receive the precious metal from a number of successive charges of ore, until it is sufficiently saturated, when it is run off by a tapping hole, to be treated by cupellation, or otherwise, to separate the precious metal from it. Although they have mentioned lead as a suitable metal for taking up the precious metal from the ore, it is to be understood that other metals that fuse at a moderate heat, such as tin, antimony or zinc, or alloys or mixtures of these may be employed. They find that an alloy of lead and antimony is particularly suitable for the purpose. It often happens that when the ore is ejected from the

amalgamating pan a quantity of the amalgamated metal in a state of fine division is carried with it. They, therefore, dress this out in the usual way. It would be interesting to learn whether the process has been tested on a practical working scale, and with what result.

March 26.

OUVERT.

WATER-JACKET SMELTING FURNACES.

SIR,—I think the most reliable details concerning this class of furnace will be obtainable from one of the advertisers in the *Mining Journal*—Messrs. Fraser and Chalmers, of Chicago—who claim, and I think with reason, that their improved furnace is superior to all others, is of great simplicity and strength, requires no brick lining, is least expensive to set up, has perfect water circulation, will run for months without stopping, with greatest economy and greatest capacity. Only one short blast-pipe is needed. Over 100 water-jacket furnaces of their make in successful operation, smelting copper, galena, and silver ores. To give some idea of what our copper furnace is doing they refer to the letter of Mr. W. R. Roney, the general manager of the Chicago Copper Company, who says after five months' trial:—"Concerning the working of the 36-inch water-jacket copper furnace I am pleased to say it has worked excellently from the first day a fire was lighted in it. We have not lost an hour on account of bad working since it started, but have been running almost continuously, except Sundays. (We shut off blast at midnight, Saturday night, and put it on again at midnight Sunday night, with very little loss of time in starting up again.) We find the furnace will smelt easily, with Connellsville coke, 27 to 35 tons per day of the class of ores we have put through it, with the coke carrying a burden of six to one. We have smelted as high as 42 tons in 24 hours with 6½ tons of coke. We maintain an average blast pressure of about 7 ozs. of mercury. The water required is furnished by a 2-inch pipe connected with the city water supply, giving a pressure of 20 lbs. to the square inch. We found one-half this amount of water was ample, but put in 2-inch connection to ensure against accident in case part of our water supply was required in case of fire. The workmanship and construction of the furnace show that it was 'made upon honour,' as we have always found all your work to be. I trust that your furnace will be as extensively used as its excellent quality deserves.—*Liverpool, March 28.* PROGRESS.

WATER JACKET FURNACES—THE PACIFIC GALENA SILVER SMELTER.

SIR,—Since the publication of my letter referring to American Water Jacket Smelting Furnaces, several of your subscribers have written to me requesting further information respecting cost and economical working as compared with other systems. I am at present unable to furnish the data required except in the case of a 30 ton water jacket furnace for smelting copper, the cost of which, with accompanying requisites, please find enumerated below. Any further information I may become possessed of will be cheerfully submitted for the benefit of your readers.—One furnace and water jacket, 30 tons daily capacity, \$4500; one extra furnace and water jacket \$1500; one 50-horse power engine with No. 4½ blower \$700; one crusher (5000 lbs.) \$600; moulds, pony pot, and crane \$2000; blacksmith's shop outfit, \$500; net price at the ironworks in San Francisco \$12,800, or about 2600*l*. sterling. It is necessary to have two water jackets so as to obviate the possibility in an outlying mining district of being compelled to stop work for repairs. A. S. CHURCH.

Brighton, March 26.

COLLACOMBE MINING COMPANY.

SIR,—The statement made by "Shareholder," in the *Journal* of March 17, that we were on the point of inspecting the mine was correct; but the representation was inaccurate that a company was about to be formed under our management to work the property. BAINBRIDGE, SEYMOUR, AND RATHBONE.

Great George-street, March 29.

PROPOSED ROCK-BORING COMPETITION.

SIR,—We noticed in the *Mining Journal* of March 10 a challenge thrown out by Messrs. MacKean and Co. Having, however, only recently had a contest with four other drills at the Falmouth Polytechnic Exhibition we did not think it worth our while just at present to go to further expense to again prove the superiority of the "Cornish" rock-drill, but the offer made is so liberal, and as we have a very deserving institution in the neighbourhood—the Redruth Miners' Hospital—where 100*l*. would be most acceptable, we beg to say that we shall be pleased to enter the "Cornish" drill, feeling a very confidence that for effectiveness in boring and economy in the consumption of compressed air that it is quite equal to the MacKean. We readily endorse the suggestions made by Messrs. Schram and Co., in last Saturday's *Mining Journal*, except that we consider that the areas of the drill-bits ought to be in proportion to the areas of the machines—e.g., when the cylinders are of different diameters—but it would be best to get them of one gauge if possible, say 3½ in. diameter, which is a fair working size. HOLMAN BROTHERS.

Camborne Foundry and Engine Works, Camborne, Cornwall.

ROCK-BORING MACHINERY—COMPETITIVE TESTS.

SIR,—I notice in the *Mining Journal* of March 10 the challenge given by Messrs. MacKean and Co. to all parties interested in boring machines. As representing the Excelsior rock drill I shall have great pleasure in accepting the challenge upon the conditions named by them, the only stipulation on my part being that the pressure used shall not be less than 60 lbs., and that the 100*l*. be deposited with an independent party. I shall be very glad of the opportunity which this trial will give of practically demonstrating to the mining community and all interested in boring machinery the fact that a valveless drill at a fair pressure is capable of drilling more quickly than any valve machine hitherto brought out, feeling sure that when this fact is established and recognised, all users of percussive drills will see the advantage of employing the machine which is the simplest, cheapest, lightest, and least liable to derangement.

Chester, March 27.

J. H. WYNNE.

ROCK-BORING MACHINERY—VALUE OF OLD MACHINES.

SIR,—I have perused in the *Journal* of March 3 and March 10 Messrs. MacKean and Co.'s letter, in which they want to make out that they have produced the best boring machine in existence. As they have had several opportunities to prove that to the mining public in the rock-boring competitions held in Cornwall these last few years, and have not entered or run in any of them, I should like to know upon what they base their calculations. I note that they state that they do not believe in such trials, and yet at the same time they make an offer that they will run their machine against any other on blocks of granite or other stone, for five days of 10 hours each. I fail to see what would be proved by a trial of this sort more than by the competitions which have already been held. They say that they will forfeit 100*l*. if they do not bore double the length of hole in the five days that can be done by any other machine; but, of course, the relative value of the machines remains to be proved (and this I have no doubt will be shortly, though perhaps not in Messrs. MacKean's favour); but surely if they had such faith in their machine as they want to make the public believe they would have entered in the late competition, as they would have stood the same chance to bore double the amount (as they boast they can do) in the short time as well as in five days.

With regard to the great speed they accomplished at the St. Gothard Tunnel, every practical miner will plainly see that such a speed could only have been obtained through the favourableness of the ground, and more must have depended upon the system of getting rid of the debris than the actual boring of it, as such a speed could only have been obtained in pick and shovel ground, which is a very poor test for a boring machine. As to the Festiniog Tunnel, I cannot see what they have to boast of over the Ingersoll and Burleigh, which was working there at the same time as when Messrs. Polckow, Vaughan sent their manager and engineer to inspect the boring machine working in a tunnel. With a view of pur-

chasing the best for their Cleveland Mines they chose the Burleigh. As regards purchasing back their machines for 60*l*. each, if that is intended to show the merit of their machine the price realised at another sale must also show it. Less than 12 months ago a mining plant was sold in Cornwall; amongst the plant were several of MacKean's boring machines, and they were bought for less than 5*l*. each, merely the price of the brass in them, and that at a time when the surrounding mines were going in for rock-boring machinery. J. McCulloch.

March 19.

DOLCOATH MINE.

SIR.—The decision of the shareholders at the adjourned meeting, held at Dolcoath last week, does not concur with the opinion of outsiders. The agreement to pay 25,000*l*. to Mr. Basset four years before the expiration of the current lease was bad. If the committee had advised the shareholders to defer any action in the matter for four years it is probable that better terms might be made with the lord. The precedent set is a bad one, and will, no doubt, be cited and acted upon by other lords to the prejudice of the mining interest.—*Truro, March 30.* R. S.

RESTORATION OF MINERALS TO THE CROWN—DOLCOATH LEASE.

SIR,—And so the Dolcoath game is at last played out, Mr. Basset coming off winner, leaving the unfortunate adventurers only to be pitied, as he had the game in his hand from the commencement. The "pound of flesh" has gone to Tehidy, and with it a precedent which miners in future will doubtless hear more of to their disadvantage, unless a stand is made at once against such dangerous proceedings. At the last and final meeting at Dolcoath, on March 21, I was more than a little surprised at one of the adventurers sneering at the idea of asking the Legislature to settle this serious question which has arisen with regard to mine leases. "He would not go whining to the Legislature for a law on the subject. Freedom of contract—let us have freedom of contract between adventurers and lords." The latter portion of this sentence "is a consummation devoutly to be wished for;" but I hold at present there is no such a thing as freedom of contract in the matter of mine leases. You must agree to the lords' terms in the aggregate or "lump it;" and because such, unfortunately, is the case, we must, according to this gentleman's advice, refuse the acceptance of the leases, and, I presume, let the mining industry die out, which would be the natural consequence of such a step.

Again, the same gentleman asserts that Mr. Basset had a perfect right according to law to ask for increased dues for a new lease. In the midst of their troubles this piece of information must have been somewhat of a consoling character to the adventurers, as no one knew or felt better than they the truth of this assertion, and yet he as one of them is diametrically opposed to any alteration in the existing laws, which are simply a disgrace to the country. In the present depressed stage mining is now passing through the lords ought to, unsolicited, give the greatest possible encouragement to adventurers, yet how few there are who do so. For the interest of mining I can conceive nothing better than to keep up the agitation created by the "groundless scare" (*alias* 25,000*l*.) at Dolcoath, and bring the question as soon as possible before Parliament, and give the coup de grace to the monster Mr. Basset has given birth to. The paper read by Mr. R. Symons before the Truro Debating Society, and which appeared in last week's *Journal*, is an able exposition of the position in which adventurers stand under the present law, and is interesting, and coming from a gentleman of so long and varied experience in mining cannot fail to impress its readers with its sound common sense.—*Perranporth, March 28.* JUSTICE.

TIN JIGGING AGAIN.

SIR,—I did not intend to trouble you again on this topic, but knowing your columns are always open to any improvement that will tend to promote the interest of mining in general, I beg your indulgence once more to publish a few lines on the subject. On my leaving the management of Wheal Jane the jigging process was abandoned for reasons perhaps it would not be prudent on my part to explain, but what has been the result? The answer is short and easy. Less tin from the same quality tinestone, and the dressing costs increased 50 per cent. Facts are stubborn things, and these are facts which no one can deny. But I am not going to give it up, so up goes the jigging again, and down will come the cost.

It pains me to go into some of our Cornish mines, especially those in which I hold a pretty large interest, to see the vast amount of cost incurred from the time the mineral arrives at the collar of the shaft until it finds its way to the calciners, and I do not hesitate to say that thousands of pounds worth per year could be saved in this department. Let any mine manager give the jigger a fair and impartial trial, and so astonished will he be with the result that unless he is pretty firm in the upper story instead of having a bubble in his head he would be more liable to get a jigging on the brain.

Wheal Jane, March 28.

RICHARD SOUTHEY.

WEST CWMYSTWITH, AND ITS MANAGEMENT.

SIR,—As a miner, and interested in mining, I should be glad to know when the new manager, about whom at one time there was so much fuss, is going to assume the management of this mine. It was reported by him at the time he inspected the mine that he was to be the manager, and that he would be visiting the mine once a week, and we were also informed that he had appointed an under agent to superintend there during his absence. But seeing that two months have elapsed and there is no clue of him at the mine, we are anxious to know what has been the improvement in the management. We quite understand that he carefully inspected the surface and underground operations, and that not feeling satisfied with what was visible underground, he ordered holes to be bored and blasted along the side of the level, as if he intended making a most extraordinary discovery, and no doubt he felt rather sanguine that an important discovery would be effected. However it is a very undecided question among the miners in the neighbourhood whether the holes were ordered in the lode or in the country rock, although he may have acted according to the best of his ability. But there is reason to doubt whether this mine can be efficiently managed, while as we understand that the new manager is engaged at a mine a short distance off to do the smithwork and superintend the development of the mine, where there are six tributaries and two or three lead ore dressers who do not always obey his orders. These are undeniable facts. However I will not go too fully into this matter at present, but for the benefit of the West Cwmystwith Mining Company I would strongly advise them to carefully consider the whole question in connection with the expenditure of their capital, and to employ no officer in any capacity without first knowing whether he is capable of undertaking the responsibilities of his office or not, ascertaining especially where he obtained his experience.

Our new manager says they are working in the wrong place for lead. How does he know that? He says there is no lead in the undeveloped eastern portion of the grant. How does he know that? Has he been in looking? He says that other mining companies are working in the wrong place for mineral wealth. And surely if he knows the very spot where the mineral wealth is he should at once give the shareholders the benefit of his knowledge. Mine inspection and management of mines should be left to those who are recognised and tutored in the art, and who are gentlemen of reputation and not pretenders. I do not know the present manager, Mr. Davison, but believe him to be possessed of technical knowledge of mining, and hence he is much respected by all who know him.

Llangurig, March 28.

MINER.

DIED,—at Darlaston, on March 27, in his 74th year, GEORGE HENWOOD, M.E., an old and esteemed correspondent of the *Mining Journal*. For many years his communications, portraying Cornish men and Cornish manners, were anxiously looked for by numerous readers from week to week, and none appreciated his writings more than those who were chosen as illustrations of eccentricities or peculiarities. As a miner Mr. Henwood had large experience, and his

reports upon mines which he inspected were at all times interesting and attractive. He has of late led a comparatively retired life, his last important engagement being as manager of mines in India worked by an English company in connection with the Maharajah of Patalialah. His death will be regretted by a very wide circle of friends and acquaintances.

REPORT FROM CORNWALL.

March 29.—How is Dolcoath going to raise its fine by August? That is the present phase of the Dolcoath question, and one that is not very easily solved. No doubt there are several courses open—more, at any rate, than the proverbial three; but is there any line of action that will definitely commend itself to the large majority of the adventurers? The idea that the money should be borrowed from the Bank can hardly be seriously entertained. It would certainly be the most costly process, though, no doubt, it has its advocates. A proposal to issue new shares to the extent required has met with considerable support; but can this legally be done? And, in any case, must not the consent of Mr. Basset be obtained as well as that of the adventurers, and is it worth while reopening any further negotiations with Tehidy that are not absolutely essential? A rebuff would not be pleasant, and would, moreover, have injurious effects. If the new shares could, however, be created and offered to the existing shareholders, in the first instance *pro rata*, there is much to be said in favour of such a scheme. Practically, indeed, it would come to much the same thing, so far as the pockets of the adventurers were concerned, in raising the money by a call; but then there would be something marketable to show for it. On the other hand, it may be questioned whether, in view of the future interests of the mine, such an increase in the share capital is desirable. The heroic way of meeting the difficulty would be by a call. To many of the adventurers, probably, it would not be a very serious matter to pay up 5s. or 6s. per share; but there are others on whom this would be an oppressive demand, and they are entitled to the fullest consideration. Upon the whole, the most feasible way of raising the money, and, at the same time, the least burdensome, seems the further suggestion made to suspend dividends until August, and then raise the deficiency direct. It is bad enough, of course, to go without dividends, but it is worse to have to put money directly out of pocket; and a call made in August, under these conditions, would only be about half the amount required now. It might be possible to reduce it still further by working the mine in the interim with the utmost vigour; nor do we see that there could be any serious objection if this were done to ease the remaining burden by a loan. The committee are very awkwardly placed, for there is hardly a course they can adopt that will not be open to some grave objection; and yet some plan they must be prepared to recommend, since they have agreed to meet the exaction.

The East Pool account ought to give ample satisfaction to the shareholders. Fluctuations are common to all forms of business, and if there is any exception to this rule assuredly it is not formed by mining. What we regard with peculiar satisfaction is the generally productive character—a good, even practical average—of the various points in operation, coupled as this is with the assurance that the mine is steadily improving in depth. We thoroughly endorse the Chairman's hopeful view of the future, so far of course as the material conditions of the mine are concerned. Further than this it would not be wise to go. Meanwhile the interests of East Pool are in excellent hands, and the vacancy in the pursership caused by the lamented death of Mr. Martyn could not have been better filled than by the appointment of Major Haye. As to the enlargement of the committee, we must be content to wait until we know in what way the enlargement is to be effected. There is no virtue at all in a mere increase of members simply as such, and while there may be wisdom in the multitude of counsellors, an executive should always be as small as is conveniently possible.

We are much less surprised at the fact that the Redruth Mining Exchange Company should have paid a 15 per cent. dividend for the past year—beside adding substantially to their reserve fund—than we shall be if similar success attends the operations of the current 12 months. In the nature of things this cannot be, and we are inclined to think the secretary of the Exchange did very wisely in unbending himself upon this point. We are really only at the beginning of the effects of the Dolcoath business, and when they see that it is leading to the withdrawal of several actual members of the Exchange, even those who are responsible for the cloud thus cast upon mining must be convinced of the utter impolicy of their proceedings—to say no more.

A good start has been made in the resuscitation of mining in the once wealthy districts of Marazion and St. Hilary, at Owen Vean and Tregurtha Downs—an 80-in. engine having been set going on Tuesday under very congratulatory circumstances. It will be an excellent thing not only for Owen Vean and Tregurtha but for the whole locality if the anticipations now with good reason entertained are speedily fulfilled.

REPORT FROM NORTH AND SOUTH STAFFORDSHIRE.

March 29.—The colliers have played half this week on account of the holidays. Supplies of coal from the Cannock Chase and surrounding localities are unusually restricted this week, consequent upon the water-way between there and Wolverhampton being blocked by repairs. The Sandwell collieries and the older Staffordshire districts are proportionately benefited. Steam coal is quoted 5s. 6d. per ton at the pits on the Chase, and forge coal 6s. House coal varies from 8s. to 10s., according to quality. Pigs keep firm at 48s. 9d. to 50s. for Derbyshire, and 62s. 6d. to 65s. nominal for hematites. The manufactured ironworks have not done much this week. Sheets and plates rolled by the "list" iron houses are quoted 9s. to 9s. 10s., and angles 8s. 10s.

At a meeting of the Iron Trade Wages Board in Birmingham this afternoon, resolutions were passed carrying out the proposals to increase the contributions to the board from 3d. to 6d. per man per quarter, and to increase by one-half the salaries of the operatives' and employers' secretaries. The Chairman said the expenses of the Staffordshire board were less than one-half those of Cleveland. A minority of the ironmasters in this district did not subscribe. It was urged that all masters who benefited by the board's decisions ought to subscribe, and the hope was expressed that they would.

Messrs. B. Smith and Sons, Wolverhampton, accountants to the Wages Board, have issued their report of the investigation of the books of the 12 selected bar firms for the regulation of ironworkers' wages, according to the new sliding-scale arrangement. They report that the net average selling price obtained during the months of December, January, and February last was 6s. 19s. 1d. per ton. Messrs. D. Jones and J. Capper, the secretaries to the Wages Board, certify that this average fixes puddlers' wages at 7s. 9d. per ton, and millmen's wages in proportion, from April 2 to June 30 next. This is a drop on the quarter of 6d. per ton in puddlers' wages and 5 per cent. in the wages of millmen.

An examination of the books of several of the Cannock Chase collieries for the four weeks ending March 7 shows the average selling price of coal to have been 6s. 2s. 2d. The Cannock Chase Conciliation Board claim that this price will carry a reduction in wages, but the men reply that, according to the scale, the average price must be reduced below 6s. 1d. before wages can be reduced. The matter has been argued at a meeting of the board in Birmingham, where it has been resolved that, before a decision can be come to, the secretary of the board must correspond with the South Wales, South Yorkshire, and North of England districts, with reference to the operation of the sliding-scale in those districts.

At a meeting of miners at Tipton, on Tuesday, it was stated that the masters sought to interfere with the eight hours' system, by compelling the men, through threats of discharge, to work a day and a quarter for a day's pay. The meeting passed a resolution urging adherence to the eight hours' system, and saying that they believe even shorter time would have to be resorted to. Other resolutions were passed, condemning over-production and disorganisation.

The untruthful statements concerning the nailers, published in a London daily paper, has caused much annoyance in this district, and

at a public meeting held at Old Hill, near Dudley, on Saturday, under the chairmanship of Mr. W. Bassano, J.P., it was resolved "that this meeting, having heard the statements read by Mr. Green, declares that they are untrue, and his opinion is that the writer has not talked with many nailers, and has not been in half-a-dozen nailshops, his evident intention being to help Mr. Broadhurst's Bill." At a meeting of employers at Birmingham, a resolution to the same purport was also passed unanimously. The Chairman of the public meeting is sufficiently acquainted with the nailmakers and the nature of their occupation to say that the letter "Among the Nailers" does not by any means fairly represent the existing conditions among them. The Chairman of the meeting of employers at Birmingham and the secretary of the committee are well acquainted with the trade in every respect, and they affirm that the statements and colouring of the correspondent fully deserve the condemnation passed upon them. The letter containing these corrections has been ignored by the newspaper which gave currency to the false statements, although it was signed by the Chairman of the public meeting, and by Messrs. W. Perry, manufacturer, Lye, near Stourbridge, Chairman of employers' meeting; Geo. Green, secretary of committee, comprising the following gentlemen:—Rev. H. W. Atkinson, LL.B., Vicar of Old Hill; Rev. G. J. Taylor, B.A., Vicar of Reddall Hill; Benjamin Hingley, J.P. for Staffordshire; Hugh R. Kerr, F.R.C.S., Halesowen; J. G. Beazley, medical officer, Rowley Regis; Thomas Standish, surgeon, Cradley Heath; T. V. de Denne, surgeon, Cradley Heath; and 26 manufacturers of nails and chains.

REPORT FROM DERBYSHIRE AND YORKSHIRE.

March 29.—In the lead mining districts of Derbyshire business has been going on much as usual, the output of ore having been kept up to about the average, which is certainly not so heavy as could be desired, or as the districts are capable of. But it is probable that things will get better in this direction when the price of lead improves, and inducements are held out to speculative capitalists. The decision in the House of Lords in the case of Wake v. Hall appears to have afforded considerable satisfaction to the working miners, confirming them, as it does, in their old rights and privileges, but which certainly have not been of much advantage to them of late years. Ironstone mining has been at a discount in Derbyshire, and the quantity raised has been yearly getting less, not in consequence of its dearth, but to the preference given to the ores found in the colliers, such as those worked in Northamptonshire, Rutland, and Lincolnshire, which are considered for certain purposes superior to some of the ironstone found in connection with the coal measures.

Of late, owing to the cold weather, there has been a considerable improvement in the business done in house coal, there having in particular been a marked increase in the tonnage sent to the Metropolitan from Clay Cross, Eckington, and some other places. There has been a slight advance in the price, but this, of course, is only for the moment, and the result of an exceptional state of things. The London merchants let their stocks get low down so as to take advantage of the reduced prices, which not unfrequently take place in April, when the consumption decreases, but they were obliged to give out orders consequent upon the demand.

Several of the collieries that had been working short time were able to find full employment for all hands, which was evidently appreciated by the men, although they have been voting to work five instead of six days a week. This they have done with the expectation that they will get as much money, at least for the five days as they had previously obtained for the six. As soon, however, as the experiment is made they will find out their mistake, for there is every probability that house coal during the summer months will be fully as low, if not lower, than it was during any part of last year. Steam coal has moved off moderately well, but there are only a few collieries that are so situated as to be able to send to a shipping port within a moderate distance, so that they have to depend upon the railway companies, and others to the blast-furnaces which are connected with the mines and owned by the same parties. It was thought at one time that Lynn would be made available for the purpose as well as Sutton Bridge, the Great Northern having laid out a large amount of money on the latter, but no coal worth speaking of has yet been shipped from either. Boston it is thought may yet be made available when the improvements now going on are completed, and it is certainly more advantageously situated for many collieries than Sutton Bridge. Manufacturing coal has become less active, and of course the same may be said as to that for gas purposes.

In Sheffield several branches of trade are in a high state of activity, and there are not many complaints in any direction. The busiest department is that of steel-faced armour-plates, for which the productive power has of late been greatly increased, but even with that the demand is in excess of the output, so that it is likely new plant will be put down at both Brown's and Cammell's. It appears that steel cannons are to supersede those made of wrought-iron, and Sheffield is likely to have its share of work in this new branch, and Mr. Wilson, the Chairman of Cammell and Co. (Limited), stated at the meeting the other day that they were getting into a position to be able to meet any demand that might be made for the steel for the new guns. Steel plates have been rather quiet of late, but it is expected that there will be more done in them during the summer for the shipbuilding yards in different parts of the country. Of late, makers of Bessemer have turned out a good deal of metal for the rail-mills as well as for other purposes, a good deal being absorbed by cutlery manufacturers and tool-makers. For the best descriptions of table, pruning, and special knives the demand has been tolerably good of late. Railway material, such as springs, points, axles, tyres, and complete wheels, have been in good request, whilst makers of sheep-shears have had plenty to do, this being their busy season. File-makers have been doing tolerably well, but a strong opposition has been raised by the men to an attempt being made by some of the employers to reduce the wages 10 per cent. At the engine-works business continues fairly good, and several of the foundries are much better off than they were, orders coming in for building and other materials usual in the spring.

REPORT FROM NORTH WALES, SALOP, AND CARDIGAN.

March 29.—The Slate Trade is in a depressed state, and some of the lesser quarries are idle. Probably, however, with the advent of more genial weather, and with the opening up of the navigation of the Baltic, busier times will come. Much of the existing depression is doubtless owing to the stormy weather, which for some time has made coasting navigation almost impossible. The same cause has affected the paving sett trade, which is an important trade along the Carnarvonshire coast. Hinging upon the prospect or hope—if it be not delusive—of better times in agriculture the limestone quarries of the North Wales border are fairly busy, considerable consignments of stone being also made for the iron furnaces of South Shropshire and Staffordshire. The ironworks are fairly well employed, and for this reason, as well as on account of the severity of the weather, the collieries have been busy. The North Wales Colliers' Assurance fund prospers; it has about 10,000 subscribers, and it has an income considerably above its expenditure.

The severe weather which has now continued for a month as a succession of snowstorms with intermediate frost has suspended all outdoor dressing operations at mines. The low price of lead also acts as an almost complete damper to enterprise, I say almost because I see, and am glad to see, the registration of new companies to work lead mines in Cardiganshire and elsewhere.

A ride from Aberystwith to Strata Florida skirts the west side of the great lead mining region of Cardigan. The mines of Goginan are left a good way to the east. The Fronchoch, Wemyss, Red Rock, and others of that group are nearer to us, as are also the mines of the Lisburne group. The one mine to the west of us is the West Lisburne, which is on our right hand as we approach Strata Florida. From this point down to Carmarthen the mining and quarrying industries of South Wales are few. There are to the east some rough slate quarries and one good lead mine, and to the west there is the Llanfawr Lead Mine, rich in silver. As we near Carmarthen we pass the old gold mining district of Gogofan, and a few mines have been

worked spasmodically for lead near Carmarthen. There is also a rather nice green slate quarry not far from the town. Next we have a run of 12 miles to Whitland without a mine or quarry. Here we turn north-west towards Cardigan, and pass on our way the Pengelly, Elwyn Valley, and Glogue slate quarries, with the Whitland Abbey, Cleddau Valley, Maenclochog, and other quarries further south of Llanfyrnach we see what has for some time been one of the best lead mines in Wales.

TRADE IN SOUTH WALES.

March 29.—The amount of coal raised in Glamorganshire in 1882 was 16,399,253 tons, Monmouthshire, 5,721,961 tons; Carmarthen-shire, 486,796 tons; Breconshire, 143,753 tons; Pembrokeshire 71,615 tons. It will thus be seen that South Wales and Monmouthshire raised nearly 23 million tons out of a total output for the whole country of 156,499,977 tons. The steam coal trade has been influenced during the past week by the strong easterly winds, which have prevented vessels from coming up the channel, as well as by the Easter holidays. Prices are not quite so firm, but the phase is only temporary. Cardiff sent away foreign 98,078 tons, and 17,582 coastwise; Newport, 20,520 tons foreign, and 19,902 coastwise; Swansea, 15,304 tons foreign, and 8627 coastwise.

The strike in the Forest of Dean has entered upon a new phase, as the colliers seem inclined to copy the example of the Fenians in the use of dynamite. A certain Mr. Wilce has made himself obnoxious by writing letters to the local newspaper condemning the miners' agent, and blaming them for being led by the nose. The reply to this was an attempt to blow up his house by dynamite, but fortunately, although the report was heard for miles around, the explosive material took an upward direction, and did little damage except to the porch of the house, while Mr. Wilce and his wife, who were in bed, were uninjured.

The steel and iron trades are reviving a little, and the outlook is more cheerful. Several parcels were sent away last week from Newport, including 1500 tons to Ancona, 1077 to Smyrna, 910 to Valparaiso, 688 to Paraiba, 520 to Santos, and 40 to Oruba. Cardiff sent away a parcel of 847 tons. Iron ore is in little demand, with a weak tendency. Cardiff received last week 5431 tons from Bilbao, and 678 from other places; Newport, 5436 tons from Bilbao, and 2010 from other places. Prices range from 13s. 6d. to 14s. per ton.

Sir Hussey Vivian is about forming one of his works here into a company; but this will not include the famous one at Hafod, started in 1810, on land granted to Messrs. Richard Hussey and John Henry Vivian. Eight hundred men are daily employed at these works, and the wages paid amount to 1500l. weekly. The make of copper is 120 tons per week, besides various acids.

TRADE OF THE TYNE AND WEAR.

March 28.—The weather still continues very unfavourable for shipping, and in consequence there is a considerable scarcity in tonnage, still many of the collieries in these rivers have been kept fairly going during the past week; there are, however, exceptions at the great Seaton Delaval Collieries, in Northumberland, the miners have only had seven days' work during the past fortnight, and at Cramlington they have had but eight days' work. The question of restrictions, as we have noticed lately, is not much discussed in Northumberland, as the works can only be kept fully going when ships are to hand. Stocks are not worked for to any great extent in the steam coal trade. The house coal trade is most brisk at present. The question of restriction in Durham has not been advanced further yet. The output of coal in 1882, as was noticed in last week's Journal, amounted to 156,499,977 tons, which, compared with the output in 1881, shows an increase of 2,315,677 tons. In Northumberland the output was 7,060,783 tons, in Durham 29,238,814 tons, giving a total of 36,299,597 tons for the district, which is but far short of one-fourth of the total production of the United Kingdom. Northumberland employed 23,368 persons, and Durham 75,498, the total for this district being 98,866 persons. As the total number of persons employed was 503,987 the number employed in this district appears to be not at all in proportion to the amount of coal raised. The inference is that the coal raised per man in this district far exceeds the amount raised per man in other districts. This will, we believe, prove to be the case, and no doubt it may partly be accounted for by the fact that in Durham a large number of the collieries are soft coal collieries, and each man works a large amount of coal in these works.

The Iron Trade has been pretty steady during the past week, and its general condition is now considered to be more satisfactory. Shipments are going on much more freely, and for the last week they amounted to 20,190 tons of pig-iron and 5503 tons of manufactured iron and steel. The makers continue very firm in their quotations, but there is as yet no advance of consequence in prices, and pig-iron is sold at little over 40s. for No. 3. The manufactured iron trade has continued to show a much better feeling; there has been more enquiry, and orders are given out much more freely. Shipbuilding iron has advanced 2s. 6d. per ton during the week, and are now 67. 5s. per ton; bars, 57. 17s. 6d. There is also more doing in foundry work. There is much railway work in hand. The wages question and the scheme for doing away with Monday's work is still being considered. The matter has been advanced a stage this week; the ten days per fortnight are promised the men on certain conditions, which will probably be accepted. The report of the Teesside Iron and Engineering Company shows a profit of over 13,000l. on last year. The coal and coke trades are unchanged. The changes in the American tariff of import duties will favourably affect the coal and iron trades here to some extent. The duty on bituminous coal is reduced one-half, and on coke 5 per cent. There is a very substantial reduction in the duty on steel rails, and there are other reductions on various articles.

At Middlesbrough on Tuesday the market was very thinly attended owing to the holidays. There was no change in the prices. There was no change in the stock held by Messrs. Connal this week; it now stands at 82,646 tons. The export trade both in pig and manufactured iron is encouraging. The Board of Arbitration, it is considered, is likely to settle the wages question this week.

THE MINERAL RESOURCES OF IRELAND.—At the meeting of the Royal Dublin Society this week, Professor V. Ball, M.A., F.R.S., delivered the annual address to the Geological Society of Ireland, of which he is President. Having glanced at the history of the society since it was founded in 1831, he said active interest in geology appeared only to exist in a limited number. With a view of aiding in the development of Ireland's mineral resources, Dr. Haughton had proposed a scheme to the society. He considered the past history of the attempts to develop the mineral resources of Ireland afforded a safe guide as to the directions in which that development might be profitably prosecuted. He considered the metallic ores occurring in Ireland—absence of suitable fuel being taken into consideration—were, with one notable exception, not of great present value, and the prospect of profitable exploration on an extended scale afforded by the coal fields of Ireland was not very encouraging. There were, on the other hand, however, mineral resources, as to the abundance of which there was no doubt, and to these Dr. Haughton proposed that certain members of the society should direct their particular attention, with a view of drawing up a series of reports, which it was hoped would prove of practical commercial value. The duty of preparing these reports had been thus allotted and undertaken:—1. Paving Setts, Dr. Haughton.—2. Anthracite Iron Ores, Prof. Hull.—3. Slates, Prof. O'Reilly.—4. Ornamental Building Stones, Prof. V. Ball.—5. Cement; and 6. Pottery Clays—the last two not being as yet allotted. The roofing slates of Ireland were not as yet by any means so largely employed as they deserved. He said this while fully conscious that they had a defect which militated against their universal adoption. Every resident in this city was aware that there were in Dublin chemical works engaged in the preparation of manures, acids, &c. Although he knew it was not the case in all still at one of those works he found recently that no one of the mineral substances which were used in these manufactures was the product of Irish soil: all

the metal work of the machinery, and the lead of the acid vats had been imported. The phosphates were from South Carolina and Cambridge, the pyrites from Spain; after burning it was re-shipped to Swansea, where it was treated in the wet way to extract a small percentage of copper present in the ore. The manganese and salt were also imported, and so were also the large slabs used in the construction of the large acid vats. As to the political questions which influenced in a superlative degree the development of this country's industrial resources he would not enter into any discussion. No fact was more generally acknowledged than that capital was sensitive, and a capitalist did not ordinarily invest his property in a country while he knew it to be in a state of unrest. Prof. Hull remarked that it was lamentable to consider the number of mineral productions in Ireland which lay undeveloped. There were magnificent quarries of granite, equal at least to Peterhead, and not inferior to those of Egypt, lying totally undeveloped. The President concluded by stating that some time ago a firm in England wished to know could they obtain a regular supply of peat charcoal from any establishment in Ireland, but it was found no establishment was in existence to give the supply, and he had seen recently that peat was used for the bedding of horses in Belfast, but he found that the peat was not got from County Down but Rotterdam.

OWEN VEAN AND TREGURTHA DOWNS MINES. STARTING OF AN ENGINE.

An engine was set to work on these mines, near Marazion, Penzance, on March 27, under very favourable auspices. The attendance included Mr. W. Molesworth St. Aubyn, M.P., Mr. H. B. Lewis, the secretary and manager; Messrs. Loam and Son, Mr. W. Derry, the local agent; Mr. E. Heard, Truro; and Messrs. G. Laity, P. Astley, Reginald Astley, R. Astley, James Rowe, Grigg, Mills, Phillips, Treloar, S. H. Laity, J. R. Laity, Roach, Hancock, and others. The Owen Vean and Tregurtha Downs Mines (Limited) Company have purchased two tin and copper mines in the Marazion district of Cornwall, which is well known for the rich and productive character of its mineral deposits. It may be as well to point out that this enterprise is removed from the ordinary run of Cornish mining ventures by the fact that Messrs. H. R. Lewis and Co., of Bartholomew House, have identified themselves with the project, and hence investors have a guarantee that their money will be spent in an economical and judicious manner. The mine is described as an extensive one, being about a mile in length on the course of the lodes, and it is situated in the centre of a group of mines which are well known to have returned large quantities of copper and tin. The reports of competent mining engineers who have recently examined it speak in the most unqualified terms of its value and prospects. One of these gentlemen says:—"The geological position cannot be surpassed—the property being surrounded by mines that have given enormous profits, and the surface on the line of the lodes for a mile in length stands in such position, that any practical miner cannot but form a most favourable opinion of the property, and recommend an energetic working of the same." Others speak with equal decision of the remunerative character of the undertaking. Thus, Mr. W. Rich, of Redruth, writes:—"There are three known productive lodes in the set, and the main engine-shaft is situated in the midst of them; there are, doubtless, other lodes standing to the north. A cross-cut could easily be put out as soon as the mines are drained to prove the ground in this direction, and to get under the ancient workings already spoken of. The shafts, already sunk, can be made available for future workings, and represent time and money saved; and with modern appliances the tin found, instead of being thrown away as heretofore, will, doubtless, be a great source of profit to the shareholders. I have a strong opinion if the mines are drained and sunk deeper they will prove a profitable and lasting property." The capital of the company is £60,000, in shares of 10s. It may be stated that the engine is a Cornish pumping one, with an 80 cylinder, 10 ft. stroke, and about 350-horse power. It was a second-hand engine, but has been so thoroughly renovated that it is now practically new. There are four large boilers of about 14 tons each. The pumps for the drainage of the mine are 20 in. in diameter, and calculated to raise 1350 gallons of water per minute, the engine being erected for drainage purposes. Messrs. Harvey and Sons, of Hayle, have done the work of renovation, and Messrs. Loam and Son, of Hakeard, were the consulting engineers. An important addition has also been made by one of Messrs. Loam and Son's steam capstans, calculated to lift from 30 to 40 tons. The total expense in connection with the engine has been about 5000*l.*, and it is the third largest engine of the class in the county. The shafts for dropping the pitwork are 75 ft. high, and the timber of which these are composed came from Vancouver's Island. The work in connection with the mine is now in such a condition that pumping operations may be commenced at once, and there is every reason to hope that the management will not have any difficulty in respect to the water, although in the first instance it caused a little concern. An underground adit about a mile in length has been cleared, but some people in the district were of opinion it never would be done; whilst the surface-water has been dealt with by gutters, &c. This, along with the building of the engine-house, the engine, out-buildings, smiths' shops, carpenters' shops, &c., has up to the present time involved an expenditure of about 7000*l.*

In accordance with a unanimous request, it was decided that the engine should be christened after Mr. W. Molesworth St. Aubyn, M.P. for Helston, the chairman of the directors of the company. Mr. St. Aubyn, in christening it, expressed great pleasure in complying with the desire that he should give it the name of "The St. Aubyn Engine," which, he was glad to know, was a name that stood fairly well in the county of Cornwall. (Hear, hear.)

Mr. M. Loam, sen., then set the engine to work, and this was taken as a signal by a large number of persons who had assembled to give three cheers, which they did most heartily. The engine worked exceedingly well, and was inspected with much interest. Subsequently the company, along with the men employed on the mine, adjourned to a large temporary out-house and partook of dinner. Afterwards the chair was taken by Mr. W. Molesworth St. Aubyn, who, having submitted the usual loyal toasts, proposed "Success to the Mine," saying he hoped this would be a red-letter day in the parish of St. Hilary. (Hear, hear.) He thought they had that day set an example which would be followed in many other parishes, because he was satisfied there still existed and remained underground in Cornwall an untold quantity of wealth. (Loud applause.) There only needed a little energy and skill to develop the same, and he himself felt proud to be connected with an undertaking like the present one. (Hear, hear.) Mr. Derry, who would respond to the toast, would give them a little history of the mine. He (Mr. St. Aubyn) was not a practical miner, and could only go by the reports he received from people; but if the reports were to be depended upon he did not believe there existed in Cornwall a finer mine, or adventurers who had better prospects than those in this mine. (Hear, hear.) On, however, an occasion of this kind they must not be too sanguine. It must not be thought that because they had a magnificent engine on the mine they were at once going to raise a vast quantity of tin and copper. He had no doubt but that there were splendid prospects, but they must not be too sanguine. They must go to work carefully and energetically, and he had no doubt but that the mine would be not only a benefit to those who had invested in it, but it would also be a splendid boon to Cornwall generally, because he believed people would see, so soon as they were paying dividends, engine-stacks smoking all around them in the whole of the western district of the county. (Applause.) He, however, would best discharge his duties, not by fulsome eulogies as to the character of the mine or district, but simply in all earnestness and with hearty good will would ask them to drink "Success to the Mine," to which Mr. Derry would respond. (Applause.)

Mr. Derry was very pleased indeed to see Mr. St. Aubyn and others present that day. He regretted they were not able to start the engine a month ago, as he estimated it would be at their statutory meeting in August last, but owing to the severe winter it was a wonder they were not more than a month behind their estimate. As to the nature of the mine he was not in a position to say. He had not been underground to see the lodes, but since he had been in the neighbourhood he had made every possible enquiry from the mining community in respect to the property, and the result of this was most satisfactory. Indeed, to it he had never heard of any dissenting voice. People were most unanimous in expressing the opinion this mine was going to be a most valuable and productive property. (Hear, hear.) All said if Tregurtha Downs were economically and properly worked the results would be very gratifying. (Hear, hear.) He thought they would see an earnest intention on the part of the directors, &c., that the mine should be worked properly by the engine which had that day been started. (Applause.) The motto of the company was "Waste not, want not," and his instructions had been to provide everything necessary to work smartly, but that at the same time he was to economise. Answering for all concerned, he might say this had been done. In the future nothing should be wanting from them—not even tin and copper. (Laughter and "hear, hear.") They would start to drain the mine to the bottom at a very desirable depth. They would commence at a point at which the mines in the locality had generally been as productive, and not so deep that the depth would prove any serious impediment to mining operations. With reference to their lords, he might say they were sinking the mine 50 fathoms below the present bottom, and everybody knew that this meant time and outlay, and as they would probably drain a large area it was hoped that the lords would not bind them to the exact sets, but that as the ground would be partially drained they would be allowed to search for mineral advantageously when they were prosecuting the mine to a greater depth. (Hear, hear.) Liberty on the part of landlords, especially in mining, reacted to their own advantage, and the adventurers would probably get means of resuscitating mining in the locality, and thus causing the land to be of benefit; therefore, he had great faith that the landlords would give them the consideration they needed. (Applause.) Respecting their staff, he might say he had been associated with the starting of mines for 25 years past, and could say, without flattery, that he had never been connected with a better or more efficient class of men than at this mine. (Hear, hear.) All seemed desirous they should give 20*l.* worth of labour for 1*l.* (Applause.) Everybody in the locality had extended the hand of welcome to them, and, in conclusion, he might remark that if he were a capitalist, with a large amount of money to spend, he would not hesitate to spend his last shilling in Tregurtha Downs, because it would prove a splendid property to those who invested in it. (Hear, hear.)

The CHAIRMAN subsequently proposed "The Engineers of the Mine," coupling with the toast the name of Mr. M. Loam, sen. He took it as a very great compliment to himself that it was the wish of all concerned that the engine should be christened after the name he had the honour to bear. (Hear, hear.) He took this to be a most graceful compliment to himself, and not only did he believe the engine to be an exceedingly good one, but he also hoped it would be associated with a family not altogether unknown and un-specified in this county. (Loud applause.) Much credit was due to Mr. Loam for the masterly manner in which he had turned out the work. (Hear, hear.) He had entered

Mr. Derry's remarks in regard to the works. He was neither a practical engineer nor a mason, but, according to his judgment, he never saw a more business-like and efficient piece of work than that in their engine-house, and everything connected with the same. (Applause.) He also endorsed Mr. Derry's observations as to the workmen. (Hear, hear.)

Mr. LOAM, replying, was very pleased to hear from Mr. Derry, their leader, the confidence he had in the mine. It afforded him much pleasure to meet the Chairman and the directors, but he was also glad to see present the miners and those interested in the welfare of the county, for to them much credit was due. The position his firm occupied in the mining world justified him in saying, without egotism, that hitherto their labours had not been in vain. They had done their utmost to cause engines to work as efficiently and economically as possible—indeed, he thought that when they had done any particular work adventurers had no reason to be dissatisfied, and that the present instance was no exception. (Hear, hear.) As to Mr. Derry, he had been the means of their accomplishing a most extraordinary amount of work, and it was seldom he (the speaker) had seen work so quickly done as it had been in Tregurtha Downs—in fact, everybody concerned had laboured well, the result of which they had seen that day in the starting of an engine which, he considered, was second to none in the county. (Hear, hear.) In conclusion, he proposed "The Health of the Chairman," who bore a name which was a household word in Cornwall, for there was no name which stood higher, or was more respected, or more justly popular than was his. (Applause.)

The CHAIRMAN, in responding, was sure he need not apologise for being present that day, because he was one with them; he was proud to be a Cornishman, and proud to do anything which lay in his power for the county generally. (Applause.) He was born in this part of the world, and, therefore, felt the greatest pride and satisfaction at holding his present position of Chairman of the board of directors in Tregurtha Mine, which he considered would be one of the finest in the county. (Hear, hear.) He was a shareholder in the mine as well as one of its directors. He regretted very much that circumstances over which they had no control prevented any of the other directors being present on this occasion, but he added that it was also at great personal inconvenience that he himself attended, and he had to come from London on the previous day, and should have to travel back during the night. He, however, felt it would not be right unless the board were represented. (Hear, hear.) Referring to Mr. Lewis, the indefatigable secretary and manager, he said that gentleman had been the life and soul of the mine. (Applause.) At first he (Mr. St. Aubyn) had grave doubts as to whether he should go on the board, owing to his time being so much occupied, but when he came to hear and read about the very good reports made by people who knew the mine, he thought if he affixed his name to the company before it assumed its present proportions it might have the salutary effect of inducing people to look into the matter, and take an interest in it. (Hear, hear.) His hearers, perhaps, did not know the serious responsibilities which were attached to the names of directors of public companies in London. If all went right the shareholders said nothing, or were pleased, but if matters took a wrong turn why the directors were "a parcel of swindlers," and people thus tried to get their money back. During his professional career he had had great experience with directors, shareholders, &c., and he could safely say there was not a more abused body of men in the world as a rule than the directors of public companies. Therefore, it was with some reluctance and consideration he agreed to accept an office upon their board, but he did not anticipate any such claim as the one he had indicated would emanate from the shareholders in this concern, and he was very proud at being the Chairman of the Owen Vean and Tregurtha Downs Mines. (Applause.) He did not think since the company had been established he had missed a single board meeting in London. (Hear, hear.) Alluding to Mr. Lewis, the latter must allow him to say, without feeling it was unfair eulogy, he had been the very life of their concern; indeed, in a very great measure their thanks were due to Mr. Lewis for the position they held that day. (Applause.) In conclusion, he assured his hearers that so long as he was connected with the company no stone should be left unturned for the good of the mine and the shareholders in it. (Prolonged cheering.)

Mr. St. Aubyn had then to leave to be in time for the London night mail, and Mr. M. Loam subsequently took the chair.

Capt. FAIRBANKS responded to "The Health of the Agents of the Mine," Mr. W. M. GREENUP to "The Health of the Solicitors to the Company," and Mr. LAITY to "The Health of the Lords of the Mine."—The proceedings shortly afterwards terminated.

Registration of New Companies.

The following joint-stock companies have been duly registered:—

THE LANCASHIRE WINE AND SPIRIT COMPANY (Limited).—Capital 50,000*l.*, in shares of 1*l.*. Established to carry on the business of distillers, rectifiers, importers of and dealers in foreign wines and spirits, &c. The subscribers (who take one share each) are—J. J. Mawdsley, Prescott; J. T. Hall, Prescott; S. H. Hartley, Prescott; J. Wallace, Wavertree; J. Barnes, Ormskirk; H. Fogg, Whiston; T. Mee, Prescott.

THE VICTORIA SALOON OMNIBUS COMPANY (Limited).—Capital 20,000*l.*, in shares of 5*l.*. The business of metropolitan stage carriage proprietors in all branches. The subscribers (who take one share each) are—T. A. Dewsbury, 24, Beaconsfield-road; T. L. Heward, 7, John-street; P. Meritt, 297, Clapham-road; W. Tanner, 136, Peckham Rye; W. Banvick, 2, Brunswick-terrace; A. Barton, 141, Rye Lane; W. Clarke, 124, Blackfriars-road.

TOROS CATTLE COMPANY (Limited).—Capital 100,000*l.*, in shares of 10*l.*. The business of cattle ranchers or cattle ranching in the United States and elsewhere. The subscribers (who take one share each) are—J. Coope, 35, Norfolk-square; H. J. Gardner, 60, Queen Victoria-street; A. P. Kinnaird, 1, Pall Mall East; H. Seton-Karr, 11, Queen Victoria-street; R. Paul, Waltham Green; E. Forbes, Elmhurst; R. L. Downshire, 46, Gordon-square; E. F. W. Foley, 3, Gray's Inn-square.

THE TELFERIDGE COMPANY (Limited).—Capital 50,000*l.*, in shares of 10*l.*. The manufacture of apparatus in relation to telephage, or automatic, or other transports by electricity, electrical conductors and motors, and other matters. The subscribers are—F. Jenkin, Edinburgh, 100; M. R. Pryor, 12, Great Winchester-street, 290; C. Hanbury, 12, Great Winchester-street, 50; W. E. Aytoun, City Technical College, 50; J. Perry, City Technical College, 50; G. T. B. Wigan, 2, Brick-court, 10; E. J. A. Balfour, 32, Addison-road, 150.

THE ECONOMIC CO-OPERATIVE SOCIETY (Limited).—Capital 5000*l.*, in shares of 5*l.*. To establish and conduct a co-operative business in Turkey. The subscribers (who take one share each) are—J. R. Thomson, Stamboul; S. Fontaine, Stamboul; J. Milligan, Stamboul; W. A. Maltass, Galata; S. T. Bond, Stamboul; E. Bartfield, Galata; A. Minorissat, Stamboul; E. Pears, Galata.

THE BUTE SHIPBUILDING, ENGINEERING, AND DRY DOCK COMPANY (Limited).—Capital 175,000*l.*, in shares of 50*l.*. To carry on at Cardiff and elsewhere the trades of shipbuilders, engineers, engine-builders, boiler-makers, founlers, smiths, dry dock owners and shipowners; also of repairs of ships, steamers, barges, buoys, and floating vessels of every kind and description. The subscribers are—P. Rawle, Forest Hill, 20; T. Callaghan, Cardiff, 100; G. Shapland, Cardiff, 60; F. J. Beavan, Cardiff, 10; W. B. Gibbs, Cardiff, 140; W. Rutter, Cardiff, 4; R. J. Gibbs, Cardiff, 60.

THE KANSAS AND NEW MEXICO LAND AND CATTLE COMPANY (Limited).—Capital 150,000*l.*, in shares of 10*l.*. To buy, breed, graze, and sell cattle, sheep, hogs, and horses, and other live stock in the United States and elsewhere. The subscribers (who take one share each) are—H. Seton-Karr, 2, Pump-court; H. Carlisle, 7, Charles-street; W. B. Richardson, 28, Charles-street; W. B. Jones, 85, Newman-street; C. Jervoise, 106, Loughborough Park; C. H. Goring, Lower Tooting; W. Pound, Tufnell Park.

THE SOUTHERN COUNTIES UNION INSURANCE COMPANY (Limited).—Capital 20,000*l.*, in shares of 10*l.*. A general insurance business against damage or loss to buildings, ships, merchandise, goods, crops, cattle, &c. The subscribers (who take 50 shares each) are—W. J. Marriott, Temple; W. D. Savage, 23, Park-road; J. Beal, Brighton; H. J. Infield, Brighton; B. Bennett, Brighton; G. F. Fairlight, Brighton; F. Hayler, Brighton; R. M. Kingaw, Brighton.

THE EAST SURREY IRONWORKS (Limited).—Capital 15,000*l.*, in shares of 10*l.*. To purchase the leases of the East Surrey Foundry, situate at Croydon, and to carry on an established business in connection therewith. The subscribers (who take one share each) are—C. Hussey, Croydon; J. Pelton, Croydon; D. B. Miller, Croydon; T. Rigby, Croydon; R. M. Hammond, Croydon; T. G. White, Croydon; T. D. East, Croydon; J. S. Streeter, Croydon.

THE AMBLESIDE HOTEL COMPANY (Limited).—Capital 10,000*l.*, in shares of 10*l.*. To purchase the Queen's Hotel, and carry on an hotel keeper's business in all branches. The subscribers are—T. Taylor, Ambleside, 286; M. Taylor, Ambleside, 21; T. Taylor, Blackpool, 71; W. J. Pennington, Windermere, 143; A. B. Taylor, Windermere, 143; T. H. Walton, Windermere, 142; J. Jackson, Windermere, 142.

THE EMERALDA EMERALD MINES (Limited).—Capital 100,000*l.*, in shares of 1*l.*. To adopt and carry into effect a contract entered into between C. Schloss and B. Koppel and R. Saravia of the one part, and John Frederick Baker of the other, and to acquire concessions, grants, leases, or takes of properties in the United States of Colombia or elsewhere for the purpose of carrying on general mining

or smelting operations. To search for, raise, and make merchantable all precious stones and minerals found in any of the lands, mines, or properties belonging to this company. The subscribers (who take one share each) are—H. T. Sankey, Canterbury, solicitor; W. W. Holmes, 35, Finsbury Circus, accountant; F. From, 20, Blenheim-road, gentleman; G. Fuller, 9, Austin Friars, secretary; E. Naunty, 9, Austin Friars, clerk; W. D. Powles, 62, Old Broad-street, merchant; C. W. Wallis, 3, New-square, solicitor. The subscribers will elect the first directors, the number of whom must not any time be less than two or more than seven.

THE CONSERVATIVE CLUB BUILDINGS COMPANY (Limited).—Capital 6000*l.*, in shares of 1*l.*. To acquire land and erect and maintain buildings in the borough of Warrington. The subscribers are—Sir G. Greenall, Warrington, 1; S. R. Latchford, Warrington, 100; T. L. Hall, Warrington, 100; J. T. Moore, Warrington, 25; T. Sutton, Warrington, 25; W. Fairhurst, Warrington, 50; J. Smithurst, Warrington, 5; W. D. Jarvis, Warrington, 25; W. Porter, Warrington, 25; J. Burgess, Warrington, 10.

THE GARSWOOD HALL COLLIERIES COMPANY (Limited).—Capital 120,000*l.*, in shares of 10*l.*. To acquire, work, and develop certain collieries, mines, hereditaments, and premises, known as the Garswood Hall Collieries, the Bryn Moss Collieries, and the White Ledge Hurst Mines, situate in the township of Ashton-in-Makerfield, county of Lancaster, and the business of colliery proprietors and coalmasters, hitherto carried on at the above place and elsewhere. The subscribers (who take one share each) are—H. R. Evans, Newport, colliery proprietor; J. D. Shakespear, Grafton-street; J. P. A. Smith, 7, Maids Hill, West, secretary; H. P. Allender, Dalston, accountant; H. W. Lee, 61, Newton-street, accountant; H. Jordan, Tottenham, sharebroker; J. Mason, 1, Pinner's-court, stockbroker. The number of directors must not exceed eight or be less than three. The first directors will be elected by the subscribers. Qualification, the holding of shares or debentures to the amount of 500*l.*

THE WORCESTER HIGH SCHOOLS FOR GIRLS (Limited).—Capital 5000*l.*, in shares of 50*l.*. To establish and maintain certain schools. Pupils professing no religion are exempt from any religious instruction whatever. The subscribers are—Dean A. Compton, Worcester, 1; F. Corbett, Worcester, 1; F. Parker, Worcester, 2; G. E. Martin, Worcester, 1; T. Southall, Worcester, 1; J. S. Harvey, Worcester, 1; G. A. Sheppard, Worcester, 1.

TOLIMA MINING COMPANY.—Advices received by the mail of March 27, of which the following is an abstract:—

Frias January returns.....	\$53,433.2
Cost.....	\$26,783.3
Subsidia cost.....	995.6 = 27,734.1
Profit.....	\$25,649.1
Equal in sterling to 4274 <i>l.</i> 17 <i>s.</i> 1 <i>d.</i>	

The underground agents' reports..... Fms. Ft. In.
of ground expended, of which..... 52 0 1
were productive, leaving..... 34 3 1
of unproductive ground..... 17 9 0

The superintendent says "as regard present appearances, the winze (sunk 7 fms.) going down beneath the 60 is following a fine course of mineral which in the sole yields 4 tons of 400 ozs. per ton per fathom. This in itself is most satisfactory. The 70 fm. east driving towards this winze shows a slight improvement upon last month's yield, but with a reduction in quality. As we approach more nearly to the bearing in advance we expect great things from this end."

The underground agent reports on the several stations as follows:—**EXPOSED SHAFT.**—Sunk last month, 4 ft. 7 in.; present depth under 70 brace, 35 ft. The lode continues of about the same width as last reported, but showing signs of being about to divide on a ridge of killas at the western end of the shaft. On the footwall leader towards the eastern end some good specimens of lead and blende ores have appeared the last few days. This leader is about 6 in. wide, principally made up of friable schist and spar, affording appreciable advantage in facilitating the sinking. The bulk of the lode is well cased with iron pyrites, but of low grade. Pitwork and pumping gear in good working order.

70 EAST END advanced 6 ft. 7 in. During the past week the ground has become easier for driving, at the same time improving in value for mineral, a good branch of blende ore forming on the hanging-wall. The end generally wears an encouraging aspect, and we have every reason to expect further improvement as it approaches the No. 2 winze under the 60 east (some 10 fms. distant) on communicating with which we expect that an extensive and rich section of ore-ground will have been opened up for extraction.

70 FM. STOPS EAST.—No. 1 stop continues to yield at about the same rate as last quoted, and appears likely to continue productive throughout the section to the level above. No. 2 stop on a small bunch of mineral at the western end of the foot of No. 1 east winze from the 60 yields paying quantities of mineral. Ground expended on these stops last week, 39.9 fms.

70 FM., No. 1 EAST WINZE.—Cutting brace for this in the north side of level is now completed, and sinking will be commenced as soon as the stuff can be cleared away.

70 EAST CROSS-CUT NORTH.—Advanced 4 ft. Nothing new met with during the month. Ground spare for driving.

70 FM. WEST CROSS-CUT SOUTH extended 3 ft. 1 in. The cross-course has become much cracked, and at present shows but little sign of improvement. A large stream of water still issues from the end. The ground is extremely hard and slow of driving.

70 WEST END.—In consequence of scarcity of water for driving drawing machinery we have become encumbered with stuff, and I have not been able to drive this end during the past or up to this in the present month. A rise was put in the back of this level close to forebreast against the 60 west winze, and communicated therewith in the early part of the month. The 70 west is now well ventilated. Risen 4 ft., sunk 2 ft.

60 FM. EAST END extended 10 feet. No change occurred during the month. **60 FM. NORTH DRIFT** advanced 13 feet 5 in. Since the western limb of the cross-course came into the end, the branch became disordered and poor. It is, therefore, not thought advisable to continue the drive for the present. No. 2, 60 east winze, sunk 7 ft.; present depth below 60, 41.3 ft. The winze continues to go down in a masterly and rich lode, worth fully 85 cwt. mineral per fathom, estimated to produce 400 ozs. fine silver per ton.

60 EAST STOPS.—No. 1 stop, by six men, worth 35 cwt. per fathom, ground worked last month 52 ft. No. 2 stop, by four men, worth 65 cwt. per fathom; ground expended 26 ft. 3 in. No. 3 and 4 stops, by four men, worth 40 cwt. mineral per fathom. Ground worked 33 ft. 3 in. The mineral from these stops produces from 300 to 350 ozs. silver per ton. Nos. 1 and 2 stops are somewhat more fluctuating in value than formerly. No. 5 stop (sole of Velandier's drift), worth on an average for length worked 3 tons per fathom of good grade mineral; ground spent 27 ft. 9 in.

A rise has been set this month in back of No. 3 stop, to four men, at 80 cwt. fathom. This is being put up to facilitate the stoping. The rise in north 60 cwt. mineral per fathom of mineral yielding about 400 ozs. silver per ton.

60 FM. WEST END.—Advanced 9 ft. 7 in. The ground is in rather unsettled condition, and the vein makes frequent fluctuations in character and product. Pockets of mineral occur in the drive, but of late not of marketable value. The end is at present idle in consequence of want of water for drainage of drawing machine.

50 FM. CROSS-CUT, south of Esperanza shaft, driven 7 ft. 8 in., has passed through one of the south droppers of the main lode containing spar and killas, but no mineral to value. Other branches are expected to be met with before reaching the south side ground favourable.

DRIFT WEST OF MODESTO'S WINZE extended 1 ft. 2 in., and holed to Tres Esquinas winze. But little of value was met with after passing through the cross-course.

STOPE IN BACK OF FOREGOING extended to cross-course (the western margin of this branch), and suspended, the high back being also poor. The men are now set to stop and sink on the continuation of the bunch in the sole of the drift where it is somewhat richer than was the case in the back stop, worth from 25 to 30 cwt. per fathom for about 3 fms. long.

50 WEST END, advanced 10 ft. The lode is 4 to 5 ft. wide, mainly consisting of light blue killas, flookan, and spar, showing a kindly appearance. Good stones of mineral were produced from the drive during the month. A winze is now being sunk under this level close to forebreast, by four men, at 80 cwt. fathom. This is being sunk with the twofold object of proving the ground between this and the 60 and ventilating both levels.

40 FM. LEVEL, Stop on South Lode.—The back being no longer of stopping value the men are now set to stop the sole where the lode is worth from 15 to 12 cwt. per fathom.

30 FM. LEVEL, East End on South Lode.—Driven 7 ft. The vein is 18 in. wide and very vuggy, composed of schist, quartz, flookan, and small quantities of iron pyrites. A considerable quantity of water issues from the vein; on the whole the end wears a rather promising appearance.

30 FM. LEVEL SOUTH, West End.—Advanced 9 ft. The end continues without change to remark since last advice, the vein presenting the same encouraging characteristics, producing at intervals some fine specimens of mineral, a selected sample of which, taken from the sole of the end during the month gave on assaying, a produce at the rate of 517 ozs. silver per ton. Some 13 or 15 fms. intervene between present end and the position (according to old section), of the point nearly vertically under the deepest of the old workings under adit. It is intended reaching this point in the drive, and thereat endeavouring to effect a communication with these workings which are not accessible by the adit.

20 NORTH LEVEL.—Extended last month 7 ft.; the vein continues without change, and has become much contracted since last report. It has been considered that inasmuch as the ventilation at this part of the vein is so defective (as well as the difficulty of dealing with the stuff being considerable), as to seriously interfere with the expeditious pursuit of both drives simultaneously, and greater importance appearing to attach to the extension of the south-west than that of the north end, it is advisable to suspend operations at the latter until such time as they can be conducted with less prejudice to those in the former.

SABANDIA MINE.—The shaft was sunk last month 4 ft.; present depth below old adit 70 ft. The vein showed no alteration to remark during the month. It continues to go down compact, regular, and well-defined. The lead appears to be widening in the sole of the mine. The ground is hard and spare for progress. Scarcity of water for the pumping-wheel keeps back the progress that would otherwise be made, but this will, ere long, be remedied, as the product is approaching completion.

SWANSEA INDUSTRIES—COPPER SMELTING IN WALES.

Midway between Swansea and Landore lying in a ravine and flanked by a bald mountain range are the extensive copper works of Sir Hussey Vivian, and in an interesting series of papers published in the South Wales Daily News, "Ap Gwilym" gives an interesting description of them. It appears that the works were started in 1810, on land belonging to the Duke of Beaufort and the Earl of Jersey, granted by lease in that year to Messrs. Richard Hussey and John Henry Vivian. Their father, Mr. John Vivian, who was a metallurgist of repute, came to Wales from Truro, and became, if I may so say, the pioneer of copper smelting in this part of the kingdom. No effort was wanting, no expense spared, but alas! success was not then to crown their efforts. But the present owner, by making science his handmaid, has not only succeeded in considerably abating the inconvenience of the fumes, but he has actually made captive the noxious copper smoke, and forced it to yield a profitable product, oil of vitrol. So world-renowned have the works at Hafod now become that foreigners flock there to obtain information of the wonderful processes to which metals are subjected; and here every year come the cadet classes from Woolwich to obtain valuable "wrinkles" in the study of metallurgy. Under the management of Mr. J. H. Vivian, the father of the present owner, the works became famous throughout the world; and through the energy and enterprise of the son, the prestige and renown have been maintained unimpaired to this day. Some idea of the magnitude of the industry which is here carried on may be formed when I mention that at the present moment 800 workmen are daily employed, that the wages bill every week is something like 1500*l.*, and that the average make of copper is 120 tons per week, to say nothing of the manufactures of acids of various kinds, for which a large and elaborate plant is necessary.

The various ores used in the production of copper are brought direct to the works from their respective treasure-houses in the bowels of the earth by ships, which coming up the Tawe, are moored alongside the works, and their cargoes speedily discharged by means of steam cranes. Among the ores which lie heaped up in rich profusion around me are the New Quebrada, from Venezuela, which contain about 10 per cent. of copper and 30 of sulphur; the poorer Norwegian, with its 3 or 4 per cent. of copper and 40 of sulphur; the Italian libiola, with its 13 per cent. of copper and 30 of sulphur; the Cornish, a powdery ore, containing 6 per cent. of copper; the Spanish, with 8 and 38 respectively of metal and sulphur; the Seville ore, with its 6 per cent. of copper; and the rich, solid Cape ore, which contains no less than 33 per cent. of metal and 25 per cent. of sulphur. So much for the ores in the rough. With regard to calcining and roasting, the first process to which the ores are submitted is known as calcining, in which the Gerstenhöfer consigner—named after its inventor—plays an important part at Hafod. Speaking of this calciner—or, to popularise the term, let us call it the "roaster"—Sir Hussey Vivian says:—"This invention was brought to my notice by the late Mr. Hermann in 1865. I at once saw its practicability and caused two experimental furnaces to be built. They were found successful. We purchased the patent, and shortly afterwards erected 43 calciners, more than sufficient to treat all our ores and regulus (which, being interpreted, means a combination of copper, iron, and sulphur) which were sufficiently sulphurous to admit of thus being dealt with. After nearly 20 years' experience, I can say that Mr. Gerstenhöfer's invention is still a success." The principle upon which this calcining process is based is the same as the alkali makers' kiln—that the heat of the furnace should be maintained by the combination of the sulphur of the material under treatment, and that no more atmospheric air shall be admitted than is necessary to maintain such combustion without fusion of the material, while the resulting sulphur gases shall be strong enough to be available for the sulphuric acid chamber—which will be treated of hereafter in connection with the works. The alkali make was limited to the use of the rough material, but Mr. Gerstenhöfer solved the problem of using the fine material. He constructed a vertical furnace 14 ft. high, 4 ft. wide, and 2½ ft. deep (inside measurement). He placed across it firebrick bars of triangular form, presenting one flat surface to the horizontal plane, and so arranged in rows one above the other that the edges of the higher triangles should coincide with the centre of the angle next below. He heated his furnace to a good red heat by a coke fire temporarily lighted in the lower portion, and when at full heat he withdrew the coke, and fed mechanically, through slits in the top, a constant and regular stream of the sulphurous material under treatment, which, falling on the highest rows of cross-bars, forms a cone on each, and then falls on to the next bar beneath, and so on until each bar of the 70 contained in the furnace receives its full charge, while the sulphur in both the falling material and that which lodges on the bars becomes ignited and burnt by the aid of the atmospheric air admitted through holes in the front of the furnace, arranged just above the top of each cone of ore, thus keeping up the heat by the combustion of its own sulphur, and giving off pure and strong sulphur gases, sulphurous, with some sulphuric acid. By this means the sulphur and arsenic are driven off in combination with oxygen as sulphuric acid gas, and certain portions of iron and copper are oxidised. The ore is filled into the bins or hoppers on the top of the furnaces, these bins containing grooved rollers. As the rollers work round a portion of the contents of the bins falls on to the bar and forms the cone to which reference has been made. The bars are kept clear by ever-watchful stokers. Take up a handful of ore after it has gone through the tribulation of the calciner, and what do we find? Simply a fine powder, which to the eyes of the uninitiated appears like so much powdered chocolate.

The next department to be referred to is that which contains the ore furnaces, where the first melting process takes place. In these reverberatory furnaces, as they are termed, there is placed a mixture of the calcined and raw ores and metal slags. The work of the furnaces is to get rid of the earthy matters in the form of slag, and leave the copper in a concentrated form. Look at the workmen skimming off the red-hot slag rolling out of the furnace mouths, like streams of lava down the sides of a volcano! When the slag has flown away what do we find left? Why we begin to see something like the result of previous processes. The residuum is, roughly speaking, copper, iron, and sulphur in equal proportions. The furnaces make four discharges in 24 hours of 2 tons each. We have now got, through the action of the reverberatory furnaces, a material which is composed of copper, iron, and sulphur, in nearly equal parts, and our business is now to discover how these are separated, and find the result in copper. The metal is taken from the ore furnaces and crushed through an eight-hole wire mesh, when it renews its acquaintance with the Gerstenhöfer consigner. In this process the greater part of the iron and a portion of the copper are converted into oxides of those metals. The metal furnaces form the next link in the chain which connects the simple ore with the pure copper. The object of these furnaces is the separation of the iron, and the leaving of the sulphide of copper. Much care is necessary here, for much depends upon the judicious use of carbonate and other ores, roasted slags, and other materials which supply oxygen for the oxidation of the metal. The metal thus obtained is sulphide of copper, the iron having been got rid of in the slag. As our calcined copper metal contains so much oxide of iron, it is necessary to add silicious matter to form a suitable slag; ores rich in silica, and, if possible, containing copper in combination with oxygen, are the most desirable for this purpose. The products of this second smelting are "white metal," almost pure copper, of 73 to 75 per cent., and metal slag. White metal is to be regarded as the standard product of the second smelting. The accurate arrangement of mixtures and calcination, so as to ensure "white metal" as a standard, is the object which every good smelter seeks to obtain, and yet I well remember, remarked Sir Hussey Vivian, "when that very product was unknown in the best conducted German works."

The immense furnaces rendered necessary here impart to that part of the works in which the "roasters" are situated a scene which Vulcan would have gloated over, and one which I fancy would have made the heart of Tubal Cain sing with joy. The material operated on in these furnaces consists of white or pimpled metal from the metal furnace—regulate from the selecting process as well as the me-

tallic bottoms from the same process. In the old method of smelting for ordinary tough copper no selecting process was adopted, but the metal just as it came from the metal furnace was used, as is now done, both for tough and best selected copper. The pigs of white metal from the metal furnace are broken into large lumps, and introduced into the roasting furnace by means of a paddle, and piled up as high as possible in the middle of the furnace. The temperature of the furnace is raised very gradually, so as to produce a very slow fusion, the melted metal falling down in drops all the while, subject to the oxidising action of two streams of atmospheric air, introduced through two holes (plug-holes) at the back of the furnace—one in either side of the bridge. After the whole has been melted down the temperature is considerably raised (the air-holes being closed up for this purpose), and the surface of the melted metal freed by skimming from it any slag floating on the face of the charge. The air-holes are then again opened, as is also the head of the fireplace, and the charge cooled down till quite set or hard. During this operation, called setting, the whole charge becomes a spongy mass, and swells to twice or thrice its original thickness when in a melting state. The theory of the roasting process is just this:—When sulphide of copper in a melting state is exposed to the action of a current of atmospheric air decomposition of the sulphide occurs, and sulphurous acid gas and oxide of copper are the result. The thin film of oxide of copper produced on the surface is immediately acted on by the sulphide of copper with which it is in contact, and sulphurous acid and metallic copper are the result, the gas passing off through the chimney, the metallic copper, from its greater specific gravity, falling through the melted mass to the bottom of the furnace, where it is protected from further oxidation. In the production and reduction of the oxide of copper dense volumes of sulphurous acid escape, and as the reduction takes place mainly under the surface of the melted metal the gas resulting from this reduction forces up the cooling metal until the whole mass assumes the spongy consistency above referred to. When the whole charge has been thoroughly cooled down, so as to become black and hard, the temperature is again raised, but very slowly and gradually, as at the first. The object both of the first slow melting and the subsequent re-melting of the cooled and raised mass is the production of surface action. In this way almost every portion is brought under the oxidising influence of the atmosphere. Generally speaking, long before the whole of the charge has been re-melted, the experienced workman finds, from the large production of oxide of copper, that it is necessary to cut off all further access of atmospheric air to prevent the whole, or a large portion of the charge, from becoming oxidised. If the oxidising process had been conducted first to the right point it will be found, after the whole of the charge has been melted and the surface freed from slag (which is mainly silicate and aluminate of copper) that the copper when tapped into pigs and cooled has a smooth blistered appearance, which appearance has given a name to the product of blistered copper. This process occupies 24 hours, and the charge varies from 2½ to 4 tons of copper. This process is essentially South Welsh, although it is now of world-wide use.

The material dealt with in the refining furnace is the "blistered" copper produced in the roaster furnace, and contains, as I have already stated, from 96 to 98 per cent. of copper. The charge is 9 or 10 tons, and occupies in this process 24 hours. It is melted during the night, and remains several hours in the furnace in a melted state. The first operation in the process of refining is the skimming off the surface of the copper the slag which has been produced in the melting of the charge, in order to facilitate the separation of the last portions of sulphur from the copper. To ascertain when the copper is "fine," or when it is perfectly free from sulphur, a portion is taken out in a ladle and allowed to cool. If it still contains sulphur, the copper rises in the centre of the ladle and bubbles out over the surface of the "set" or hardened portion, or shows a number of black spots, generally forming a circle according to the quantity of sulphur still left in the metal. When perfectly free from sulphur there occurs a depression in the centre of the copper in cooling, called the "set." When it has arrived at this state the copper exhibits in the fracture a dull red appearance, and is very brittle and unmanageable. In this state the copper contains a considerable quantity of protoxide of copper, which has been made up or absorbed by the melting mass as quickly as formed at the surface. In most cases it reaches the point of saturation by the time the whole of the sulphur has been driven off, to effect which the surface of the copper is exposed to the action of the air. The next operation is a reducing or deoxidising one; to convert the oxide of copper which the copper holds into the metallic state; the surface of the charge is covered

with stone, coal, or charcoal, and in order to bring every portion of the mass under the influence of the reducing covering on the surface of the charge a pole of hard wood is pressed down into the melting mass, and the ebullition caused by the escape of the gases from the burning poles so stirs the whole mass that gradually every portion of the charge is brought into contact with the carbonaceous covering, when the oxide of copper yields up its oxygen to the carbon on the surface, and the whole mass becomes malleable. The changes which take place by this stirring up of long poles are ascertained by frequently taking out small portions of the copper and examining the fracture, which, when the process is complete, is smooth and silky. If the process of "poling" is carried too far, the whole mass suddenly becomes "overpoled," in which state the colour of the copper becomes much whiter in the fracture, and the copper assumes a fibrous, crystalline structure when broken, and when ladled by men with long ladles into the square moulds which surround the furnaces, and look like squares of vermilion paint, and, on setting, it rises in the centre, just as silver does when cooling in a test.

In the rolling and cutting sheds there are a number of gigantic steam-shears, in which the metal is cut expertly and expeditiously to the required dimensions. There are moulds in which the copper is stamped into different shapes, and an immense piece of machinery, which saves a vast amount of labour. It is a steam-stamp, which converts a flat circular piece of copper into the bowl-like arrangements which are used for the ends of locomotive and other boilers. The work is almost instantaneous. Sulphuric acid is largely manufactured at Hafod, and an immense capital must have been sunk in the provision of the extensive plant necessary. There are a set of pyrites kilns or burners, and the acid is obtained from two sources—from the Gerstenhöfer consignors and from the kilns themselves. The most improved systems and inventions have been adopted, and the result is a large production of acid, which is afterwards used at the superphosphate works and alkali works belonging to the same firm, and situated in the same neighbourhood. Gold and silver are also worked at the Hafod establishment, but the details of the processes used are kept secret.

FOREIGN MINING AND METALLURGY.

As regards the French iron trade, the state of affairs appears to be becoming rather aggravated if anything, merchants' iron having been maintained with difficulty at Paris at 7*l.* 10*s.* per ton, and ordinary plates at 9*l.* 16*s.* per ton. At a recent meeting of foremasters of the Nord it was decided that measures should be taken for reducing the production, but that prices should remain at the same level as hitherto. The same system has been adopted in the Longwy group, and it is proposed as from the 1st prox. to blow out five furnaces. The annual production will thus be reduced to the extent of 60,000 tons at Longwy and 40,000 tons at Nancy, or altogether 100,000 tons, and it is expected that by this means the stocks which have accumulated will be run off, especially as they are not of any great importance. In consequence of the proposed reduction in the production of pig in the North and East of France, quotations for coke have exhibited a downward tendency. There has been no material change in the price of pig. White has made 2*l.* 14*s.* 6*d.* per ton; white speckled, 2*l.* 15*s.* 4*d.* per ton; grey speckled, 2*l.* 16*s.* per ton; and grey, 2*l.* 16*s.* 10*d.* per ton. The aspect of the German iron trade is relatively favourable, and the future presents itself under fairly encouraging conditions. Prices have been well supported. Bars and casting pig have been especially in demand, while there have been numerous transactions in plates and rolled iron. In Westphalia producers of refining pig have decided to maintain quotations at 3*l.* 2*s.* per ton, and scarcely any business has been done below that rate. The German steelworks have continued to be well employed. Several adjudications for tyres and axles have taken place at Cologne; Krupp, of Essen, secured a contract for 1930 tyres at 3*l.* 2*s.* 6*d.* per ton. The exports of rails from Germany in January amounted to 15,323 tons; plates were also exported to the extent of 3260 tons.

The Belgian iron trade has experienced scarcely any change, the conditions of affairs being generally dull and monotonous. The feebleness in quotations for iron is evidently attributable to a want of orders. On the other hand, pig has been firm, in consequence of the scarcity of raw materials. Some transactions have been concluded in girders, a contract for 3000 tons having been secured by a rail mill in the Hainaut. The works producing girders appear to be fairly well employed; some of them have even orders on hand for two or three months in advance. English pig has made 2*l.* 8*s.* per

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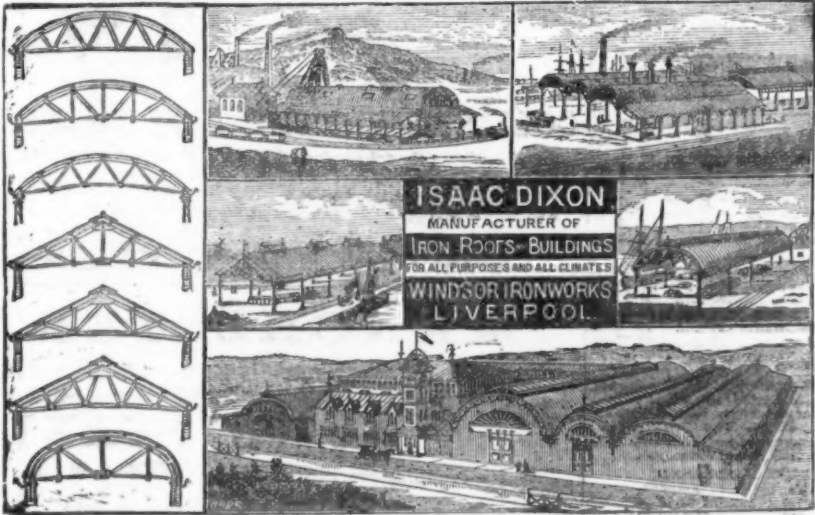
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ton in Belgium. Refining pig has been firm at 27. 2s. to 27. 10s. per ton, according to quality, while the Luxembourg group maintains a quotation of 27. 6s. per ton. Girders have been a little firmer at 57. 12s. per ton. Plates have been maintained at 77. 4s. per ton, but without much strength. Plates of commerce have made 87. 16s. to 97. 12s. per ton. The John Cockerill Company has concluded a contract for 8000 tons of rails (with the option of supplying a larger quantity) on Canadian account. The terms are 57. per ton, free on board at Antwerp. The same company has also secured an order for 1750 tons of rails for the South Italian Railway. The John Cockerill Company has launched its eight steamer at Hoboken; this steamer has received the name of the Archduke Rodolph, being intended to replace a steamer of the same name, which was cut in two in the Escant in the course of 1881. A ninth steamer is on hand for the company, and will be launched in May.

The Belgian coal trade has remained generally firm. Household coal has, perhaps, been scarcely so well maintained; but, taking the situation as a whole, scarcely any change can be reported in it. In the Couchant de Mons industrial coal has been maintained with firmness at 8s. 10d. to 10s. per ton, according to quality. The condition of the German coal trade may be said to be satisfactory. No important change has occurred in the tone of the markets, except, perhaps, that household has been in rather better demand. The deliveries of German coal to Italy in February amounted to 4390 tons, as compared with 6080 tons in January. The Council of Administration of the Sacré Madame Colliery Company has issued its report for 1882. This company carries on its operations at Dampremy, Belgium. The net profits realised for the past year are returned at 20,4237., but interest and obligations, and sundry other charges, reduced this amount to 15,9197. The dividend for 1882 is at 10 per cent.

ELECTRIC LIGHTING PROGRESS.—ELECTRICAL POWER STORAGE.—At the recent meeting of the Electrical Power Storage Company, in referring to the usefulness of accumulators, the Chairman (Sir Daniel Cooper, Bart.) stated that for four months past they had had a launch constantly running on the Thames in the most satisfactory manner, whilst in a few weeks they expected to be in a position to run a tramway car on the road with a similar amount of success. The intention of the directors was to work on steadily as manufacturers, but not to enter into competition with their customers, though they were desirous of having their accumulators used as generally as possible. It had, however, been necessary for them to make certain installations, and to carry out others by way of exhibiting what they could do. In this manner they had supplied them to nearly all the electric lighting companies, to the New Law Courts, for use in an Atlantic steamer, at the offices of the Peninsular and Oriental Steam Navigation Company, and at the Grand Hotel, where 400 lights have been fitted up, and will be running in a few days. The Science and Art Department at South Kensington, and the Pullman train to Brighton were also lit by their accumulators, whilst they are supplying the Anglo-Austrian Company with an accumulator of 700 electrical horse-power for the illumination of the Opera House at Vienna. The total amount of the orders received up to the present time was 6400 electrical horse-power, equivalent to about 20,0007.—a fact which, considering the few weeks they had been selling accumulators publicly he regarded as most promising. In conclusion, he expressed the decided opinion that they might look forward to the universal and extensive employment of their accumulator, which stands not only without a rival, but is so perfected and simple in itself that it can be employed and handled by anyone, and with the most satisfactory results. Mr. J. S. Sellon, the deputy-Chairman of the company, expressed the opinion that in time electricity would be a great rival to steam as a motive-power, especially as what had until lately been its greatest objection—the matter of storage—had now been satisfactorily settled. It would thus be possible to utilise the tremendous forces of Nature in the shape of wind and water with the most satisfactory results.

CORNISH PUMPING-ENGINES.—The number of pumping-engines reported for February is 15. They have consumed 2172 tons of coal, and lifted 16.2 million tons of water 10 fms. high. The average duty of the whole is, therefore, 50,200,000 lbs. lifted 1 ft. high by the consumption of 112 lbs. of coal. The following engines have exceeded the average duty:—

Coal's Kitchen—55 in.	Millions	56.7
Dolcoath—85 in.	56.4	56.4
Mellancar—76 in.	52.1	52.1
West Basset—Grenville's 70 in.	53.5	53.5
West Basset—Thomas's 80 in.	59.6	59.6
West Wheel Seton—Harvey's 85 in.	68.5	68.5
West Wheel Seton—Rule's 70 in.	56.4	56.4

VICTORIAN YEAR-BOOK.—The sixth annual edition of this work—that for 1881-82—prepared by Mr. H. Heylin Hayter, C.M.G., the Government Statist of Victoria, has just been issued (Melbourne: the Government Printer. London: George Robertson, Warwick-square), and affords continued evidence of the satisfactory progress of the colony. The manufactures and works in 1882 employed 3601 more males and 1077 more females than in the preceding year, 28,856 males and 7159 females being employed in the latter year. The approximate value of the machinery and plant used was 2,624,3487., being an increase of 369,0327. of lands, 1,301,0457., or an increase of 51,0627.; and of buildings, 2,184,3977., or an increase of 22,5287. These figures are exclusive of flour-mills, breweries, distilleries, brickyards, potteries, tanneries, fellmongeries, wool-washing establishments, woolen-mills, and soap, candle, and tobacco manufactures; if these be included the land (no estimate being made for Government land), buildings, and plant exceed 8,000,0007. in value. The Year-Book contains a vast amount of interesting information.

COPPER ORES.					
Sampled March 7, and sold at the Royal Hotel, Truro, March 22.					
Mines.	Tons.	Price.	Mines.	Tons.	Price.
Devon Great Consols. 129	129	£1 1 8	Gunnislake (Clitters). 23	23	£4 2 6
ditto 125	125	1 12 0	South Caradon 89	89	3 13 0
ditto 120	120	1 10 0	ditto 81	81	3 14 6
ditto 118	118	1 10 0	ditto 80	80	4 19 6
ditto 115	115	1 17 0	Marke Valley 50	50	3 4 0
ditto 112	112	1 15 0	ditto 46	46	3 4 6
ditto 68	68	2 0 6	ditto 36	36	3 0 6
ditto 67	67	4 6 6	ditto 33	33	2 7 6
ditto 60	60	6 10 0	ditto 10	10	8 3 0
ditto 37	37	8 10 0	Bedford United 89	89	3 8 0
Levant 83	83	5 3 0	ditto 33	33	3 9 6
ditto 82	82	5 3 0	Gawton 114	114	3 12 6
ditto 71	71	6 2 0	Emily 56	56	3 19 6
ditto 70	70	6 5 0	ditto 50	50	0 18 0
ditto 69	69	5 4 6	Prince of Wales 49	49	0 11 6
ditto 60	60	5 8 0	ditto 33	33	2 17 6
ditto 25	25	2 19 0	ditto 23	23	2 11 0
ditto 3	3	42 0 0	East Caradon 55	55	2 2 6
Gunnislake (Clitters). 103	103	5 4 6	ditto 45	45	3 2 6
ditto 91	91	4 16 0	Phoenix 40	40	4 14 6
ditto 85	85	4 11 0	New West Caradon 20	20	3 13 0
ditto 84	84	4 9 6	Mid-Devon 15	15	3 2 6
TOTAL PRODUCE.					
Devon Great Con. 951	2226	5 0	Emily 106	2267	12 0
Levant 463	2504	12 6	Prince of Wales 105	181	14 0
Gunnislake (Clitters). 446	2080	0 0	East Caradon 100	257	10 0
South Caradon 250	1024	11 6	Phoenix 40	188	0 0
Marke Valley 175	577	2 6	New West Caradon 20	73	0 0
Bedford United 127	434	13 0	Mid-Devon 15	46	17 6
Gawton Copper 114	71	5 0			
AVERAGE STANDARD.					
Average standard	£ 97 10 0	Average produce	£ 3 9 0		
Quantity of ore	2912	Quantity of fine copper	145 tons 3 cwt.		
Amount of money	£10,043 6 0				
LAST SALE.—Average standard, £101 1 0 Average produce, 57%					
Standard of corresponding sale last month	£105 6 0	Produce, 57%			
COMPANIES BY WHOM THE ORES WERE PURCHASED.					
Names.	Tons.	Amount.	Names.	Tons.	Amount.
Vivian and Sons	728½	£291 16 6			
P. Grenfell and Sons	621	2735 10 6			
Nevill, Druce, and Co.	618	1087 7 8			
Williams, Foster, and Co.	718	2829 13 9			
Mason and Elkington	226½	799 17 6			
Total	2912	£10,043 6 0			

Copper ores for sale on Thursday next, at Tabb's Hotel, Redruth.—Mines and parcels.—Mellancar 507—West T. digon 186—West Godolphin 9.—Total, 702 tons

MINING MACHINERY.

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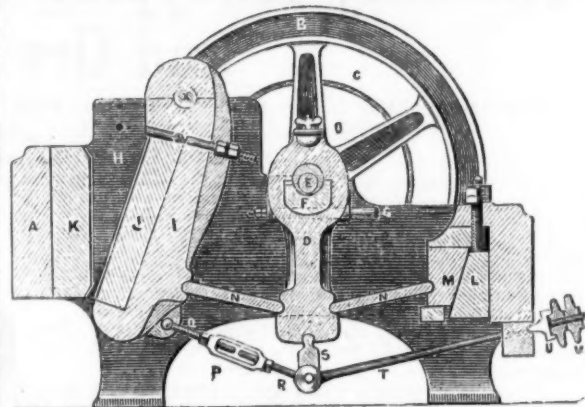
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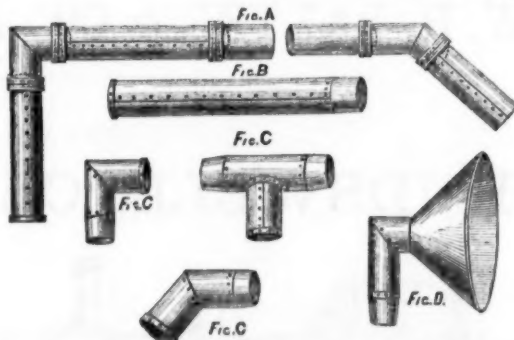
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Collieries, Tanks,
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Mines, &c. General
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Fig. B.—Straight length of tube.
Fig. C.—Different angle bends.
Fig. D.—Is a hopper to receive air at top of shaft.

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LEAD AND COPPER MINES.

Jigger Bottoms and Cylinder Covers woven ANY WIDTH, in Iron, Steel, Brass, or Copper.

EXTRA STRONG PERFORATED ZINC AND COPPER RIDDLES AND SIEVES.

PERFORATED IRON, STEEL, COPPER, AND ZINC PLATES IN VARIOUS DIMENSIONS AND THICKNESSES.

Shipping Orders Execute with the Greatest Dispatch

ESTABLISHED 1850



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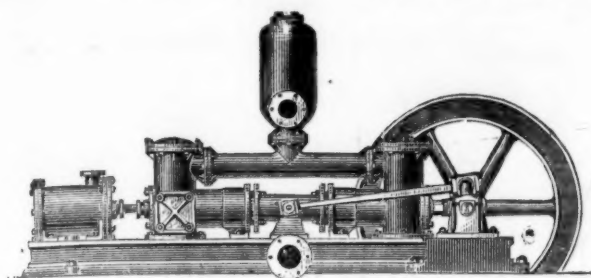
(LATE OMMANNEY AND TATHAM)

SALFORD, MANCHESTER.

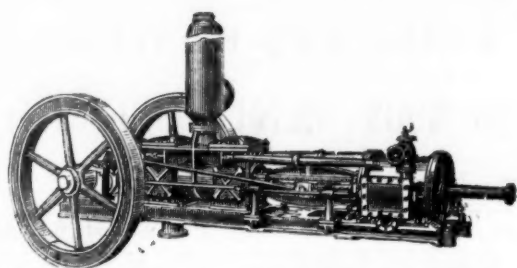


FLY WHEEL PUMPING ENGINES

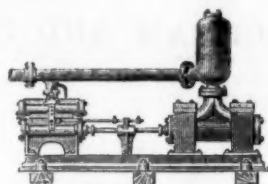
ARE THE ONLY RELIABLE ENGINES FOR STEADY WORK AND ECONOMY.



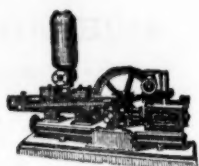
The "Original" Double-acting Ram Pumping Engine.



Direct Double-acting Piston Pumping Engine



Hydraulic Pumping Engine for Collieries. Worked by Natural Head of Water, and saving much manual labour.



Double-acting Horizontal Pumping Engine. For Feeding Boilers, Gas Works, Tanneries, Breweries, and all Pumping Purposes.



WIPPERMANN AND LEWIS'S PATENT AIR INJECTOR. These Injectors are being universally adopted for Pumping Engines for Collieries & Waterworks



The Salford Pump.

PUMPING ENGINES of all descriptions.

WINDING Ditto.

AIR COMPRESSORS.

HYDRAULIC ENGINES.

VALVES for Steam, Water, &c.

ELECTRICAL FIRE ALARM.

The superior rapidity of electricity, as compared with every other agent as a means of intercommunication, naturally suggests its application for indicating the occurrence and locality of fire in towns or large buildings, and its inestimable utility for this purpose has been very frequently demonstrated. Recognising the fact that the danger to the inmates increases with the size of the building, Mr. W. C. GORDON, manager of the Langham Hotel, has effected an arrangement whereby the firemen, who are on duty day and night in the hotel, can be instantly summoned to any floor of the building on which an outbreak of fire might occur. It should be premised that there are 10 floors at the Langham, and on every floor there are ample means of extinguishing a fire. There are stands of fire-extinction appliances, fire-buckets, and hand-pumps, always filled and ready for work, whilst rising mains run from bottom to top of the building and are always kept charged with water at a high pressure. On every floor is a hydrant, with hose and branch pipe on the stand close by ready for attachment. The necessity for this in a building where so many lives are constantly at stake is obvious; but there has hitherto been wanting means of instantly summoning the firemen to the precise locality of the outbreak of fire, no matter where it occurred or in what part of the building the men might be at the moment. This has now been satisfactorily accomplished by Mr. Gordon's arrangement, which is simple in arrangement and certain in action. The apparatus consists of four main parts—the ordinary push or circuit closer, the battery, the bell, and the indicator, which are, however, connected up by a special device. On each of the 10 floors are pushes and indicators, whilst bells are placed in different parts of the hotel, so that they can be heard at any and every point. The indicating tableau has as many signalling apertures, each provided with a signal disc, as there are floors in the hotel. On a fire taking place the visitors or servants at once make use of the push, which instantly sets all the bells ringing, the locality of the fire being at the same time made manifest by every indicator in the building.

With regard to the details of the invention it is explained that there are as many electrical circuits as there are signalling apertures in each indicator, the circuits corresponding respectively to the different floors of the building, and each circuit passes respectively through the operating electro magnet of the signal disc in every indicator which is appropriated to denote the particular floor to which the circuit corresponds, and all these circuits are connected in multiple arc with the main leads from the poles of the battery. Each circuit between (say) the first indicator and its junction with the main lead is carried to any convenient point of the floor which the signal disc upon it are appropriated to denote, and at this point it is broken and provided with the push piece, whereby the circuit may be closed through all the indicators, and the signal disc denoting that floor brought into view at its aperture in each indicator. In the circuit of the main lead between the last indicator of the series and, say, the negative pole of the battery are interposed a number of electric bells arranged in multiple arc. To enable all the signal discs which have been actuated to be returned to their normal position, by closing a circuit at any one of the indicators each indicator is provided with a set of reversing magnets, one for each signal disc, all these magnets being arranged in series and connected at one end with the negative pole of the battery, whilst a wire from the other end is branched to a push piece or circuit closer upon each indicator, a wire connected to the positive pole of the battery being similarly branched to the push pieces, so that on the circuit being closed at any one of them a current will be passed through the whole series of reversing magnets of all the indicators, and will thus return any of the signal discs, which may have been previously thrown over, to their normal position. The signal discs are carried by polarised needles, pivoted so as to oscillate between the pairs of actuating and reversing electro magnets.

CASELL'S PUBLICATIONS.—Canon Farrar's Life and Work of St. Paul, part 15, contains the continuation of the account of Paul at Ephesus, and is illustrated by many admirably executed engravings, including views of the bridge near Pylæ Cilicæ, of the ruins of Sardis, of a ruined arch at Ephesus, of Pergamos, and of Ephesus, with the tower called the Prison of St. Paul. Knight's Dictionary of Mechanics, part 76, extends from Stone-saw to Stump-extractor.

HOLLOWAY'S PILLS.—WEAKNESS AND DEBILITY.—Unless the blood be kept in pure state, the strongest constitution will fall and disease supervene. These truly wonderful pills possess the power of neutralising and removing all contaminations of the blood. They quietly but certainly overcome all obstructions tending to produce ill health, and institute regular actions in organs that are faulty from derangements or debility. The dyspeptic, weak, and nervous may rely on these pills as their best friend and comforters. They improve the appetite and thoroughly invigorate the digestive apparatus. Holloway's pills have long been known to be surest preventives of liver complaints, dreadful dropsies, spasms, colic constipation, and many other diseases always hovering round the feeble and infirm.

The Only Knapping Motion Stone Breaker and Ore Crusher.

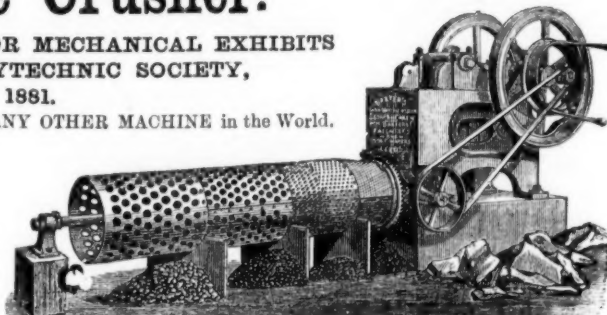
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GENTLEMEN,—We have the pleasure to inform you that the 20 by 9 Stone Breaker supplied by you is now working to our entire satisfaction, and we are now able to fulfil our contract with ease, which we had much difficulty in doing before with the Blake Machine. It takes less power and turns out considerably more stone.

Yours truly,
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GUARANTEED NO INFRINGEMENT OF ANY OTHER PATENT

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FOR FULL PARTICULARS ADDRESS TO THE PATENTEES AND SOLE MAKERS,

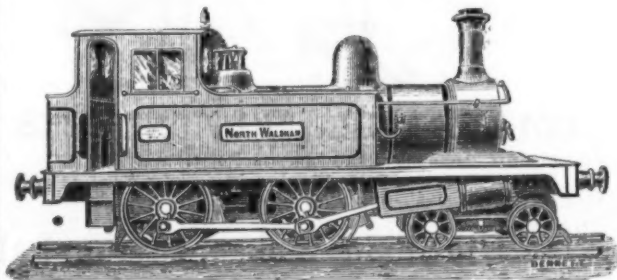
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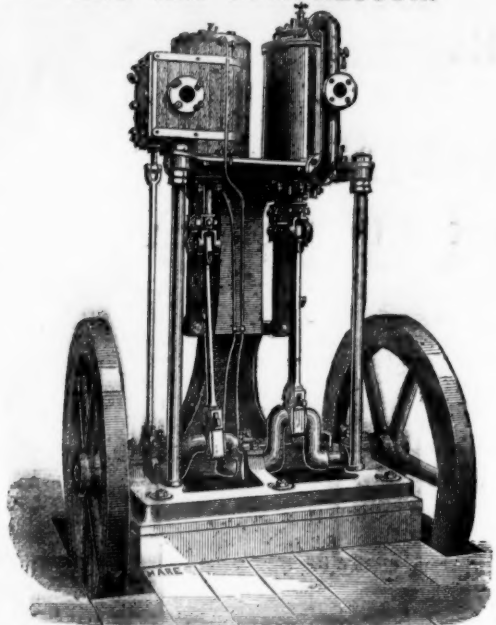
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The wood-cut represents one of these Air-Compressors. Four of them, of three different sizes, can be seen, at work, in about an hour's walk through the Camborne Mining District.

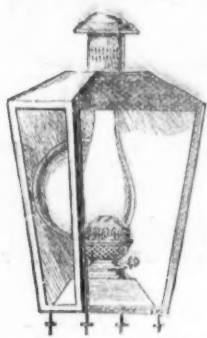
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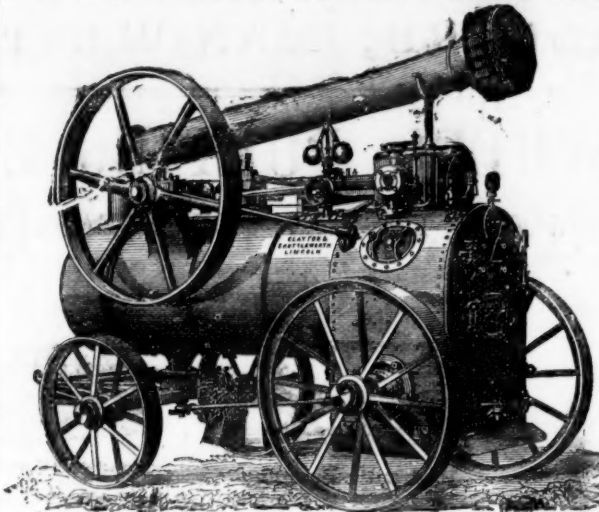
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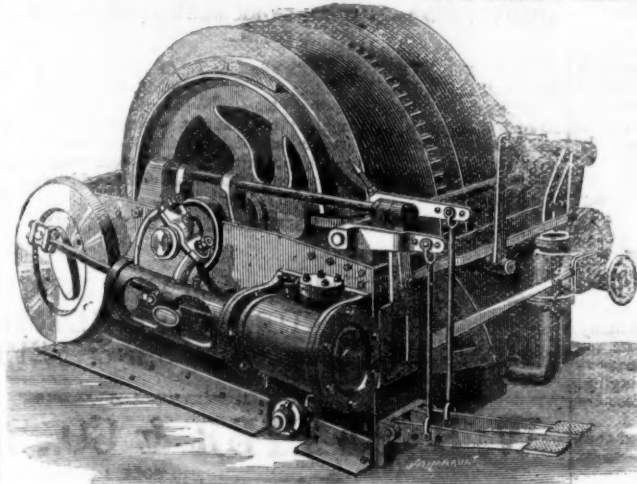


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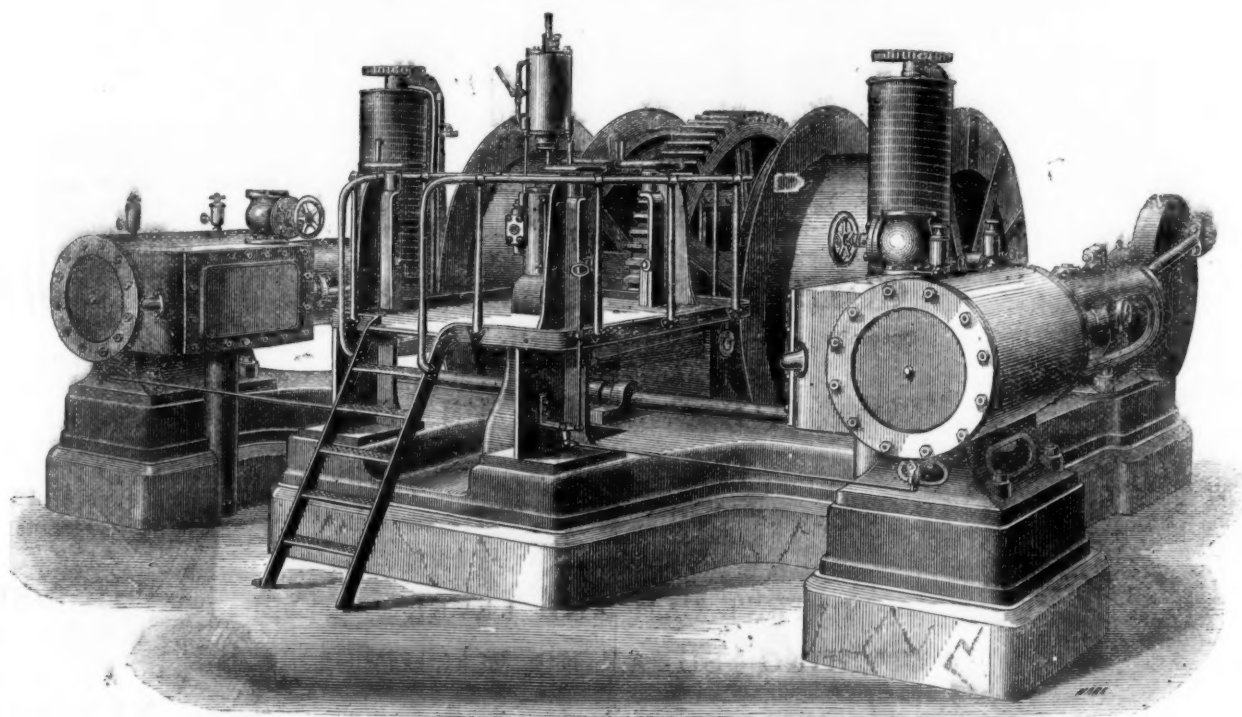
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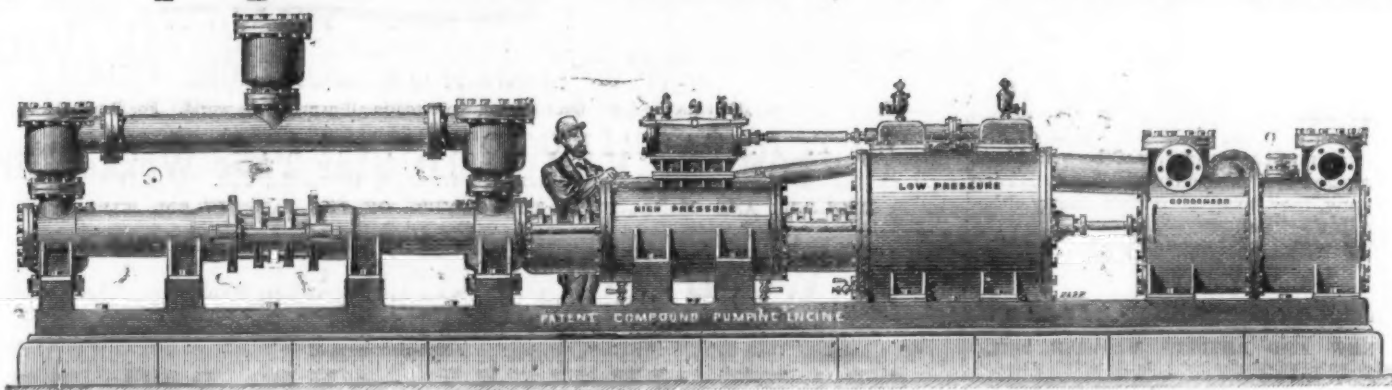
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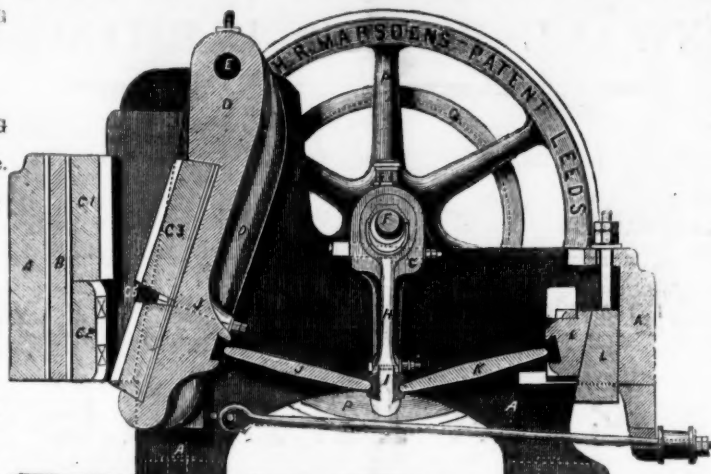
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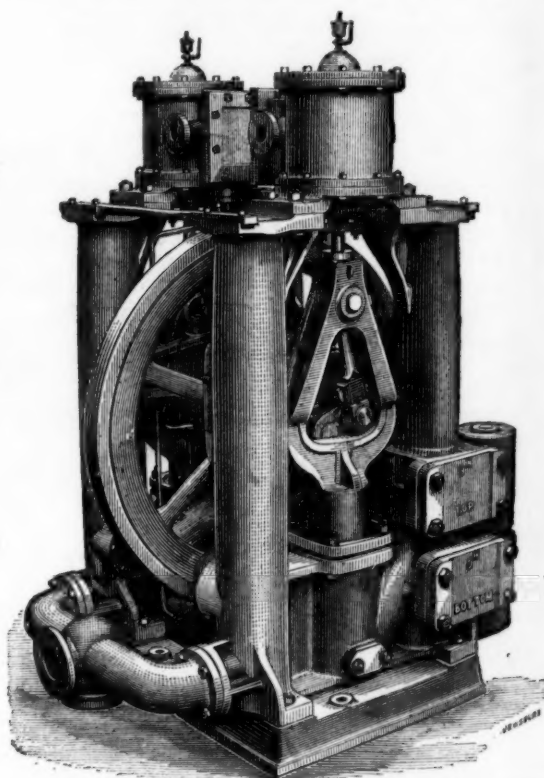
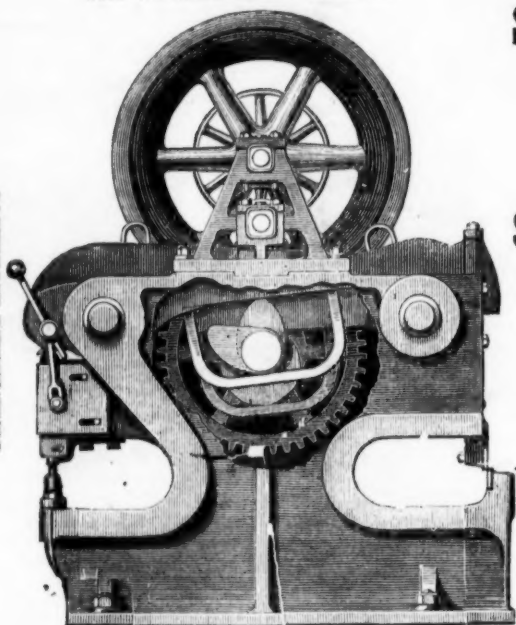
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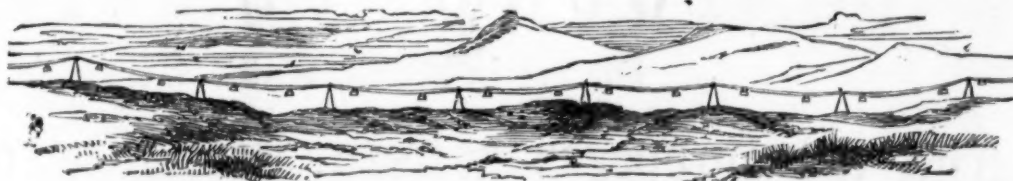
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